

EFFECTS OF REARING SYSTEM AND BODY WEIGHT OF REDBRO BROILERS ON THE FREQUENCY AND SEVERITY OF FOOTPAD DERMATITIS

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Abstract: High market demand for high-quality chicken paws, as well as their role in the assessment of the welfare of broiler chickens are the main reasons for the research in this area. In order to determine the effects of rearing system and the body weight of moderate growing broilers on the frequency and severity of incidence of footpad dermatitis, experimental research was conducted on a total of 300 Redbro chickens reared in free range and floor system in the production facility until the age of 84 days. Based on an individual weighing of broilers and visual evaluation of the incidence and severity of footpad lesions at the end of the experiment, the frequency of the individual scores for footpad dermatitis was determined, as well as the average score in each of the five weight groups. The effect of body weight on the incidence and severity of footpad dermatitis was not statistically confirmed, but the absence of the most difficult forms of footpad dermatitis in broiler group with the lowest body weight was recorded. Rearing broiler chickens in free range system manifested a positive effect in terms of increased frequency of broilers without lesions and less frequency of moderate and severe lesions in relation to rearing system in the production facility. Also, the effect of rearing system on the frequency of the most severe degree of dermatitis in broilers Redbro was statistically confirmed.

Key words: broiler, body weight, footpad dermatitis, rearing system

Introduction

Contact lesions on the plantar surface of the feet are usually defined as footpad dermatitis. These are inflammatory lesions that are ranked based on the size of the affected area and its depth. In severe cases they are ulcerative changes that are covered with scab formed from exudates, litter and fecal matter. The occurrence of footpad dermatitis is a problem of productivity, economic efficiency and welfare of broiler production. Before the 80-ies of the last century, there was

no interest in exploring footpad dermatitis due to the low market value of chicken paws. Today there is a huge demand for quality chicken paws that have become the third economically important chicken product (*Shepherd and Fairchild, 2010*). The pain caused by severe lesions and as a result, difficult movement, may affect the reduced feed intake and reduced weight gain of broilers. In addition, the occurrence of pain and limited ability to meet basic physiological needs, as well as the expression of the essential behaviours are reasons why footpad dermatitis is used as an indicator of welfare. Factors that have been identified as important for the development of contact dermatitis in broiler production conditions are temperature and humidity, the quality and type of litter, stocking density, photoperiod, the composition of the mixture for feeding, types and distribution of drinkers and season (*Ferrante et al., 2006; Bilgili et al., 2006; Škrbić et al., 2009; Škrbić et al., 2012; Meluzzi et al., 2008*). Some studies point to the importance of genotype in terms of susceptibility to the development of footpad dermatitis (*Ask, 2010*). Differences in the incidence of footpad dermatitis were determined depending on the genetic predisposition of hybrids to growth rate (*Kjaer et al., 2006*) and in broilers of moderate growth rate, depending on the rearing system (*Đukić Stojčić et al., 2013*). In male broilers, a higher frequency incidence and severity of footpad dermatitis cases were determined compared to female animals (*Bilgili et al., 2006*), which may be associated with greater body weight and more intensive contact with the litter. However, there are conflicting data on the effect of gender on the occurrence of footpad dermatitis (*Kjaer et al., 2006*), as well as the data confirming the connection between gender and body mass of chickens and footpad dermatitis (*Nagaraj et al., 2007*).

The aim of the study was to investigate the effect of rearing system and body weight of broiler genotypes predisposed to moderate growth rate on the frequency and severity of occurrence of footpad dermatitis.

Materials and methods

The experiment was two-factorial (rearing system and weight, 2x2), with a total of 300 Redbro chickens. Day-old chicks were moved into the facility with a floor system and reared until age of 84 days. The stocking density was 12 birds/m². Feeding was *ad libitum* and complete diets based on corn/soybean, containing 22.2% CP and 3100 Kcal/kg; 19.4% CP and 3110 kcal/kg, or 17.3% CP and 3170 Kcal/kg. Light program after the initial 23 L:1 D for 7 days, included six hours of darkness per day. After 42 days, chickens in the rearing system with free range (n=150) were provided daily access to the range area of 10 m²/bird. At the end of the experiment, at the age of chicks of 84 days, individually weighing was carried out, and visual evaluation of occurrence and severity of footpad lesions in all chickens in the experiment (*Thomas et al., 2004*). The absence of lesions was

scored as 1, moderately severe lesions - score 2 and the worst forms of lesions - score 3. For the purpose of data processing, based on measured body weight groups were formed: I (2.0-2.5 kg); II (2.5-3.0 kg); III (3.0-3.5 kg); IV (3.5-4.0 kg) and V (> 4.0 kg), and in each of them the frequency of individual footpad dermatitis scores, as well as the average score, were determined.

Data were analysed by ANOVA using StatSoft software (STATISTICA 8, 2007). Data expressed in percentages were previously transformed to *arc sin*.

Results and Discussion

Table 1. Effects of body weight and rearing system of broilers on frequency and average score of footpad dermatitis

Treatment	Frequency of score, %			Average score
	1	2	3	
Group of body weight				
I	90.62	9.38	0	1.09
II	91.99	6.28	1.73	1.07
III	89.91	8.09	2.0	1.10
IV	93.22	4.28	2.5	1.08
V	96.15	1.92	1.93	1.06
Rearing system				
poultry house	90.90	6.26	2.83	1.05
free range	93.86	5.72	0.43	1.13
Significance				
body weight	ns	ns	ns	ns
rearing system	ns	ns	p=0.052	ns

ns- no significance

Test results did not confirm the hypothesis of a negative effect of higher body weight of Redbro broilers on score frequency, and the incidence and severity of footpad lesions (Table 1). Most chickens without lesions were recorded in the groups with the highest body weights (IV and V). However, in these groups, a higher incidence of lesions of the most difficult level was determined. In the correlation analysis of differently scored footpad dermatitis case, and using a system of nine scores, *Allain et al. (2009)* have found a negative correlation between the score indicating the absence of lesions and those that are related to the most severe ones, as confirmed by our results. In contrast, in the groups with lower final weights, a lower percentage of chicks without the lesion was established but also increased incidence of moderate lesions compared to the groups IV and V. Only in the group with the lowest body weights, the incidence of the most severe

lesions was not recorded. In support to the absence of the effect of body weight on the incidence and severity of footpad lesions are also quite similar average scores in groups ranging from 1.06 to 1.10.

In terms of the effect of rearing system on the incidence of footpad dermatitis, the differences between the free range system and the rearing system in poultry house were not statistically confirmed. A slight positive effect of free range system may be concluded on the basis of a number of birds with the absence of footpad lesions, as well as lower incidence of moderate to severe lesions. Also, differences in the frequency of occurrence of footpad dermatitis of the most severe level between rearing systems were on the border of statistical significance ($p=0.052$).

Frequency of footpad dermatitis scores in groups of body weight, depending on the rearing system (Table 2), indicated some interaction effects of body weight and rearing systems. Free range rearing system showed a positive effect on the condition of the foot pads in broilers of greater body weight. The limit of the manifestation of this effect is the group III or the broilers of body weight 2.5-3.0 kg. In groups III, IV and V the increase in frequency of score 1 is registered in the free range system in relation to the rearing system in the poultry house. Also, the advantage of the free range system is reflected in the absence of the most severe forms of dermatitis, except in the group IV. The rearing system in the poultry house, the most serious cases of footpad dermatitis were registered in all groups of chickens except the first weight group.

Table 2. Frequency of footpad dermatitis scores in groups of body weight depending on the rearing system

Group	Rearing system	Frequency of score, %		
		1	2	3
I	free range	81.25	18.75	0
	poultry house	100	0	0
II	free range	94.34	5.66	0
	poultry house	89.65	6.9	3.45
III	free range	95.83	4.17	0
	poultry house	84.0	12.0	4.0
IV	free range	97.87	0	2.13
	poultry house	88.57	8.57	2.86
V	free range	100	0	0
	poultry house	92.3	3.85	3.85

Footpad dermatitis is the most common form of dermatitis in broiler production (*Haslam et al., 2007; Allain et al., 2009*) indicating their importance for the assessment of welfare and quality of products. The issue of ability to move of broilers is more pronounced with the intensification of their growth (*Kestin et al., 2001*) and in this sense the role of footpad dermatitis should also be considered. In

this regard, all the factors, genetic, growing conditions, diet, which affect the intensity of the growth may be brought in connection with the incidence of footpad dermatitis. The effect of gender on the incidence of footpad dermatitis has been considered in previous research as the effect of body weight leading to lower mobility and intensive contact with the foot litter. Higher frequency of footpad dermatitis in male chickens has been reported by *Bilgili et al. (2006)*, and in females by *Kjaer et al. (2006)*. Discrepancies of the results on the effect of gender and body weight, according to *Shepherd and Fairchild (2010)*, suggest a non-significant effect on the incidence of footpad dermatitis. The results of our research are in concordance with this statement. However, the total rejection of the effect of body weight on the incidence and severity of footpad dermatitis would not be entirely correct, because on the one hand generally unexpressed problem with footpad dermatitis in the flock, based on the average score of all groups and on the other hand, due to the complete absence of the most severe forms of footpad dermatitis only in the group with the lowest body weight.

Improved conditions of growing broilers, i.e. lower stocking density, the greater thickness of the litter, photoperiod similar to the natural, improve the status of broiler welfare, including reduced occurrence of footpad dermatitis (*Meluzzi et al., 2008; Škrbić et al., 2011*). In this sense, the positive effect of free range system could be seen relative to the rearing system in the production house. In the present study, the frequency footpad dermatitis of the most serious level was significantly reduced in the free range system. The full impact of the rearing system can be viewed on the interaction effect with the body weight. The positive effect of free range rearing system was manifested in broiler chickens in the group with the highest body weight. In contrast to our results, *Pagazaur and Warriss (2006)* have determined the most common incidence of footpad dermatitis, as well as the highest percentage of the most severe forms of footpad dermatitis in free range and organic rearing systems in relation to the three types of floor rearing systems in the poultry house. These results were likely influenced by different age of broilers in different rearing systems, considering that broilers in free range and organic system were grown up to a maximum age of 56 and 70 days, respectively, leading to deterioration of the condition of their foot pads. The problem with the comparison of the results of researches on this topic is in the rearing conditions that vary between farms, especially between the farm and the experimental conditions. Another reason is the use of different, non-standardized systems for evaluation of footpad dermatitis.

Conclusion

Generally, the condition of foot pads of Redbro broilers in the experiment was satisfactory in all weight groups and rearing systems. This may be related to

genetic predisposition of broilers for moderate growth and experimental conditions, which made it difficult and possibly unrealistic to minimize the effect of the studied factors. The effect of body weight on the incidence and severity of footpad dermatitis was not statistically confirmed, but the absence of the most severe forms of footpad dermatitis in broiler group with the lowest body weight was evident.

Statistically significant effect of rearing system was determined on the frequency of the most severe forms of dermatitis. Rearing of broilers in free range system increased the percentage of chickens without lesions and reduced the frequency of moderate and severe lesions in relation to rearing system in the poultry house.

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Efekti sistema gajenja i telesne mase Redbro brojlera na učestalost i težinu footpad dermatitisa

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Summary

Velika potražnja na tržištu za kvalitetnim pilećim nogama, kao i njihova uloga u proceni dobrobiti brojlera su osnovni razlozi za istraživanja u ovoj oblasti. U cilju utvrđivanja efekata sistema gajenja i telesne mase brojlera umerenog porasta na učestalost i ozbiljnost pojave footpad dermatitisa, sprovedeno je eksperimentalno istraživanje na ukupno 300 Redbro pilića gajenih u sistemu sa ispustom i podnom sistemu u objektu do uzrasta 84 dana. Na osnovu individualnog merenja telesne mase brojlera i vizuelne ocene pojave i težine lezija na nožnim jastučićima, na kraju ogleada, utvrđena je frekvencija pojedinačnih ocena za footpad dermatitis, kao i prosečna ocena u svakoj od pet težinskih grupa. Efekat telesne mase na učestalost i ozbiljnost footpad dermatitisa nije statistički potvrđen ali je utvrđeno odsustvo najtežih oblika footpad dermatitisa u grupi brojlera sa najmanjim telesnim masama. Gajenjem brojlera u sistemu sa ispustom ispoljen je pozitivan efekat u smislu veće frekvencije brojlera bez lezija i manje frekvencije umerenih i teških lezija u odnosu na sistem gajenja u objektu. Takođe je dobijena statistička potvrda efekta sistema gajenja na frekvenciju dermatitisa najtežeg stepena kod Redbro brojlera.

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