Brazilian Journal of Poultry Science
Revista Brasileira de Ciência Avícola
ISSN 1516-635X Oct - Dec 2011 / v.13 / n.4 / 241-245

Influence of Genetic Strain and Season on Back Scratch Lesions in Broilers

■Author(s)

Pilecco M[1]
Almeida Paz IC de L[2]
Tabaldi LA[3]
Nääs I de A[2]
Garcia RG[2]
Caldara FR[2]
Alves MCF[1]
Felix GA[1]

1 M.Sc. Student of the Post-Graduation Program in Animal Science, Faculdade de Ciências Agrárias, Universidade Federal da Grande Dourados, Dourados, MS, Brazil.
2 Professor, Faculdade de Ciências Agrárias, Universidade Federal da Grande Dourados, Dourados, MS, Brazil.
3 DCR grantee, Faculdade de Ciências Agrárias, Universidade Federal da Grande Dourados, Dourados, MS, Brazil.

■Mail Adress

Márcio Pilecco
Rua Clóvis Bevilaqua N°105
79.835-014. Dourados, MS, Brasil.

E-mail: mpilecco@yahoo.com.br

■Keywords

Broiler production, carcass quality, management.

■Acknowledgements

The authors are thankful to BRF – Brasil Foods S.A. for making their facilities and data available for this study.

Submitted: May/2011
Approved: December/2011

ABSTRACT

This study aimed at evaluating the influence of genetic strain, sex, and season on the incidence of back scratches during the rearing period. Male and female broilers of two genetic strains reared during the hot or cold season were evaluated. This meta-analysis included 894 samplings in 351 broiler houses of contracted farms located in the state of Mato Grosso do Sul, Brazil, in 2010. Broilers of all ages (1 to 43 days) were sampled, capturing 2% of the birds in the house at each sampling. Each flock was evaluated twice, in 21-day intervals. Broilers were reared as single-sex flocks; there were no straight-run flocks. Scratch lesions were classified as present or absent. Strain A broilers presented lower scratch rates ($p < 0.05$) than strain B birds. During the starter period (1 a 21 days), males presented higher scratch rates ($p < 0.05$) than females, and the incidence of these lesions was lower during the hot season compared with the cold season. It was concluded that different management practices can be adopted to minimize back scratches in broilers of different sexes and strains during hot and cold seasons, such as reducing weight control frequency and the period of chick containment in brooder circles.

INTRODUCTION

Animal welfare and carcass quality of broilers are directly implicated in scratch lesions (Allain *et al*., 2009), which are caused by the nails when birds huddle, and are related to poor feathering, litter problems, environmental factors, and stress (Brasil, 2001). Moreover, scratches damage the skin, allowing the contamination by microorganisms, which eventually impairs live performance (Scalan & Hargis, 1989; Macklin *et al*., 1999; Andrade, 2005). The incidence of this skin lesion is influenced by management (Holroyd, 2000), rearing density, equipment used in the poultry house, genetics (Garcia *et al*., 2002; Baracho *et al*., 2006; Allain *et al*., 2009), transportation, and the transit of people, vehicles and animals (Warriss *et al*., 1993; Hildebrand, 2005).

The incidence of trauma, particularly of scratches, increases due to the increase in flock density in broiler houses, and the application of feed restriction and lighting programs, as these increase the competition for feed (Fallavena, 2005).

Although less feather coverage may allow heat dissipation in broilers reared in hot environments, it is required to maintain carcass quality. In broilers, the feathers on the back and legs, reduce the incidence of several skin lesions, such as breast blisters, scratches and other skin trauma resulting from poor feathering (Garcia *et al*., 2002; Leeson & Walsh, 2004; Mendes, 2004). Therefore, feathering is important, as well as bird density during rearing. If birds are maintained at acceptable flock densities, there is less contact among birds, reducing the chance

of trauma (Garcia *et al*., 2002). Field observations show that poor feathering is an issue particularly in males reared under high densities and during periods of high environmental temperature.

Rearing density is an important factor when rearing high-yield broilers, which have special management and nutritional requirements. The strain to be reared should be chosen according to the management practices and regional climate, and submitted to a flock density that allows good welfare conditions and good carcass quality (Moreira *et al*., 2001). Carcass quality and live performance are influenced by genetics, which also determines bird behavior, expressed as casiness or agitation (Holroyd, 2000; Andrade, 2005; Allain *et al*., 2009). It was shown that males are more aggressive and have higher weight gain, presenting larger and deeper scratches than females, making their carcasses more susceptible to downgrading. However, the frequency of skin lesions is higher in females (Macklin *et al*., 1999).

High flock density in the broiler houses associated to high environmental temperatures directly influence broiler welfare, particularly when the rearing environment presents poor control of the environmental factors, and it is not possible to provide thermal comfort to the birds (Beraquet, 1999; Ávila, 2004). High environmental temperatures, associated to management failures may favor the incidence of back scratches.

The objective of the present study was to evaluate the effect of two seasons (hot and cold season) and of two broiler strains on the incidence of back scratches during the growth period.

MATERIALS AND METHODS

This study was carried out in contracted broiler farms located in the county of Dourados, state of Mato Grosso do Sul, Brazil, latitude 22° 32' 10''S to 22° 16' 32''S and longitude 55° 43' 32''W to 54° 09' 54''W.

The broilers houses used in the study were between 100 m and 150 m long, 12m wide, and 3.5m high. Houses were equipped with one of two types of feeders (manual or automatic), drinkers (nipple or bell drinkers), and ventilation systems (positive- or negative-pressure fans). All houses were made of bricks, covered with white-coated fiber cement roof, equipped with double curtains and polyethylene dropped ceiling, wood furnaces for brooding, minimal ventilation system, fogging system, shading trees, and rice-husks litter.

Back scratches were compared between two broiler commercial strains in the period between January and October of 2010. Seasons were defined as hot (January until May), with an average temperature of 23.8ºC, and cold (June until October), with an average temperature of 17.3ºC. Strain A is characterized by early growth, voracious appetite, slow feathering, high nutritional requirements, high daily weight gain (average of 72.09 g bird^{-1} day^{-1}), 1.68 average feed conversion ratio and calm temperament. Strain B is characterized by compensatory weight gain during the last rearing weeks, fast feathering, intermediate nutritional requirements, intermediate average daily weight gain (average of 65.11 g bird^{-1} day^{-1}), 1.75 average feed conversion ratio, agressive temperament, disease resistance and tolerance to high temperatures. (Aviagen, 2004; Cobb-Vantress, 2009).

In order to carry out this meta-analysis, 894 samplings were carried out in 351 broiler houses located in the region mentioned above. Broilers of all ages (1 to 43 days) were sampled, capturing 2% of the birds in the house at each sampling. At the end of the experimental period, a total of 275,000 broilers were evaluated, representing 5% of a total number of 5,500,000 housed broilers, being 175,000 strain A and 100,000 strain B birds. Broilers were reared as single-sex flocks, that is, there were no straight-run flocks. Out of the 275,000 evaluated birds, 136,000 were females and 139,000 were males.

During the samplings carried out when birds were 1 to 42 days, birds were sampled in six defined and opposed sites from one end to the other of the broiler house. Scratch lesions were classified as present or absent. Out of the 814 samplings carried out in 347 broiler houses, birds were sampled daily (from one to 42 days) in three broiler houses, whereas in the remaining broiler houses (344) two samplings were carried out at regular 21-day intervals. During this period, scratches were considered as rearing scratches.

All broilers were reared until 43 days of age at a density of 12.5 bird m^{-2}, whereas the lighting program applied followed the recommendations of the manual of each genetic strain.

When birds were 43 days of age, 80 samplings were carried out in 80 different broiler houses. Birds were evaluated immediately after catching in the plastic crates to send to the processing plant. The detected scratches were classified as catching scratches.

Data collected in the broiler houses were transformed in percentages and compared with the rates found in the processing plant of the contracting company.

Data were submitted to analysis of variance and mean comparison tests at 5% significance level with the aid of SOC statistical package (Software Científico: NTIA/EMBRAPA, 1997).

RESULTS AND DISCUSSION

During the starter period (one to 21 days), sex differences ($p<0.05$) in scratch rates were observed only in strain A, with males presenting higher scratch rates, which may be attributed to the fast initial growth rate of this strain, particularly in males (Figure 1).

In the period between 22 and 34 days of age, scratch rates were different between strains ($p < 0.05$), and females presented lower scratch rates than males. This difference between sexes may be explained by the faster feathering of females and the higher average daily weight gain of males, which resulted in higher weight density per area for males (25.2 kg m^{-2}) than for females (21.6 kg m^{-2}) during this period. This is consistent with the results of Garcia *et al*. (2002) and Allain *et al*. (2009), who found higher carcass lesion rates in males.

During the period of 35 days to market, back scratch rates were lower ($p < 0.05$) in strain A than in strain B, both in females and males. Strain A males presented higher scratch rates due to the higher weight density per area (36.1 kg m^{-2}) compared with the females of the same strain (32.3 kg m^{-2}) during the period of 35 days to market, corresponding to a difference of 3.8 kg m^{-2} between sexes. In a previous study on broiler carcass quality, Garcia *et al*. (2002) also found that the incidence of carcass lesions linearly increased with increasing rearing densities.

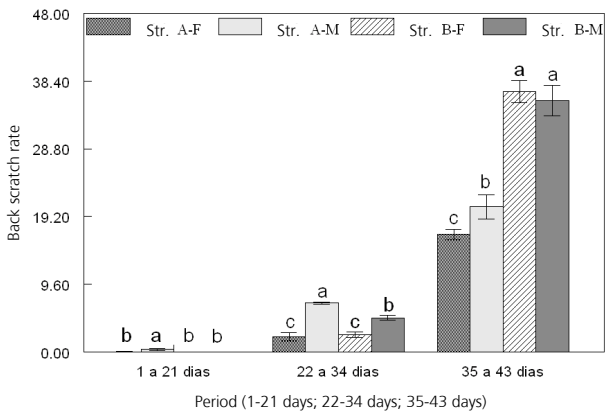

Figure 1 - Back scratch rates in male and female broilers of two different strains according to rearing phase. Means followed by the same letter in each phase are not statistically different by the test of ($p < 0.05$). Str. A-F: Strain A female, Str. A-M: Strain A male, Str. B-F: Strain B female, Str. B-M: Strain B male.

As expected, strain A birds showed calmer behavior than strain B birds, moving slowly, even when frightened, this reduced the probability of scratches in these broilers.

Strain A birds presented higher growth rate and slower feathering, and therefore, it could be expected that they would have higher scratch rates than strain B birds (Proudfoot & Hulan, 1985; Cobb-Vantress, 2009). However, strain B birds were more easily frightened, which contributed to increase scratch rates. This indicates that, among the factors that cause back scratch lesions, behavior played a decisive role, overwhelming the possible protection of the better feathering of strain B. Consistent findings were reported by Allain *et al*. (2009), who showed that the increase in carcass lesions due to scratches is related to stress during rearing.

There was no difference between sexes in strain B ($p > 0.05$) during the period of 35 days to market. This result may be attributed to the good performance of the females in this phase, which reduced the difference in weight density per area between sexes (34.8 kg m^{-2} in males and 33.2 kg m^{-2} in females, resulting in a difference of 1.6 kg m^{-2}).

The data obtained from the samplings in the broiler houses where not different from the total count determined in the processing plant ($p > 0.05$). This shows that the data obtained from the samplings are representative of the entire bird population of the studied region (Table 1).

Table 1 - Comparison of scratch rates found in the processing plant and in the samplings carried out during catching a apanha.

Strain	Sex	Back scratch rates	
		Broiler houses	Processing plant
A	Female	24.89% ± 1.79	24% ±2.16
	Male	30.11% ± 1.46	29% ± 1.56
B	Female	46.06% ± 2.87	44% ± 2.21
	Male	38.45% ± 1.45	39% ± 2.28

There were no significant differences among between the means obtained in the broiler houses an in the processing plant by the test of Scheffé ($p < 0.05$).

Season affected the incidence of back scratches. During the starter phase (one to 21 days of age), scratch rates were low, close to zero, during the hot season and 1.94% during the cold season (Figure 2), which may be attributed to the low bird density during this period. The increase in the incidence of scratches during the cold season may be explained by the fact that birds were housed in a smaller area for brooding. The function of the brooding circle is to protect chicks

from drafts and to limit the area available for the chicks, which then remain closer to the brooder, drinkers and feeders, in addition to prevent the dissipation of the heat generated by the brooder (Ávila, 2004). However, the brooding circles must be enlarged as chicks grow, and, although their removal depends on environmental temperature, it is recommended that they are removed when broilers are 18 to 21 days old.

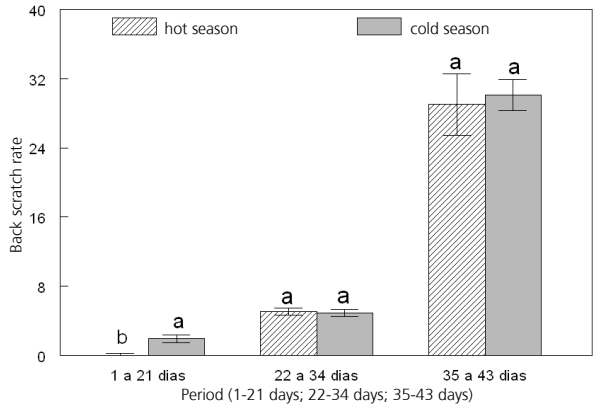

Figure 2 Back scratch rate during the hot and the cold season according to rearing phase. Means followed by the same letter in each phase are not statistically different by the test of Scheffé ($p < 0.05$).

During the grower phase (22 to 34 days of age), average scratch rate was 5.04% during the hot season and 4.88% during the cold season, whereas in the finisher phase (35 to 43 days of age) rates were higher, of 29.01% during the hot season and 30.13% during the cold season. It may be inferred that this was caused by the increase in bird density, measured in kg of bird per square meter (kg m^{-2}), as birds grew order.

Birds were weighed twice during the finisher period, on days 35 and 42, which increased bird stress and movement, resulting in a high incidence of scratches. Scanlan & Hargis (1989) also reported that broilers presented higher incidence of scratches after five weeks than earlier in life.

It was observed that the evolution of the incidence of back scratches during the cold season was similar to that of the hot season. However, considering the starter phase, the average rate of scratches was higher ($p < 0.05$) in the cold season, when birds started to present scratches already at 18 days of age (Figure 3). This suggests that the maintenance of the brooding circle for a longer period during the cold season increased weight density per area (13.7 kg m^{-2}) compared with the hot season (10.8 kg m^{-2}), which may explain the earlier occurrence of scratches in the cold season. Scanlan & Hargis (1989) had already suggested that skin lesions in broilers are related to season.

On the other hand, when analyzing the evolution of back scratches with age during the hot season, it was observed that these lesions started to occur after 21 days. After 35 days, scratch rates sharply increased to critical levels, higher than 10%, which may be attributed to the increase in weight density per area as compared to the starter period, when density was probably no sufficient to cause scratch lesions. As birds have more space to move around, they are less prone to suffer scratches (Garcia *et al.*, 2002; Fallavena, 2005). In the studies of Scanlan & Hargis (1989), a few skin lesions were reported in three-week-old broilers.

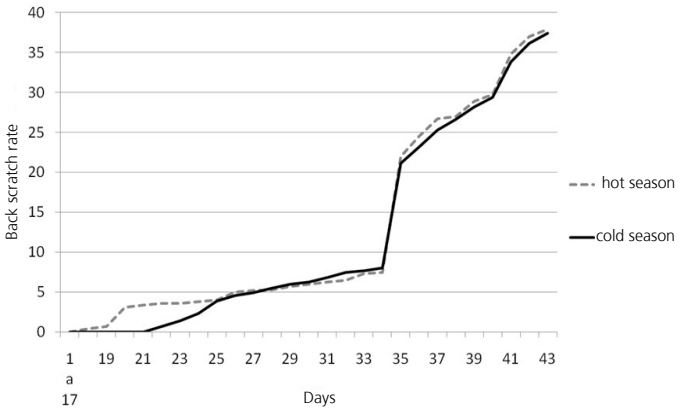

Figure 3 - Evolution of rearing scratches as a function of bird age during the hot and the cold season.

Birds were regularly weighed every seven days, according to the management practices of the local farms. This may have contributed to increase the incidence of back scratches because the weight density per area (10.8 kg m^{-2}) when broilers were 21 days old probably did not allow sufficient flight space when birds were frightened by external interferences, causing overcrowding in some areas of the house. Broilers were again weighed at 35 days of age, which also increase scratch rate. Therefore, weighing birds only once, at 38 days of age, instead of twice, at 21 and 35 days of age, would probably reduce scratch rate. Studies have shown that weighing broilers between seven and 21 days of age efficiently reduce mortality due to ascitis, sudden death, leg problems, etc., allowing adjusting bird density during rearing to improve performance and profitability, in addition to bird welfare. Inadequate weight density per area causes leg problems, scratches, bruises, and mortality (Cobb-Vantress, 2009).

CONCLUSIONS

Calmer birds (strain A) presented lower scratch rates. The males of this strain were more susceptible to scratches than the females, whereas sex did not influence the scratch rate of the flightier strain (strain B). Proper management during rearing, independently of strain and sex, reduced carcass downgrading in the processing plant. The incidence of scratches increased when birds were weighed both during the hot and the cold season, suggesting that weight control should be less frequent.

The main tool to reduce the incidence of back scratches in broilers is to improve management practices, which includes the elimination of unnecessary procedures, such as frequent weight control.

REFERENCES

Allain V, Mirabito L, Arnould C, Colas M, Bouquin SL, Lupo C, Michel V. Skin lesions in broiler chickens measured at the slaughterhouse: relationships between lesions and between their prevalence and rearing factors. British Poultry Science 2009; 50(4):407-17.

Andrade CL. Histopatologia e identificação da Escherichia coli como agente causal da celulite aviária em frangos de corte [dissertação]. Niterói (RJ): Universidade Federal Fluminense; 2005.

Aviagen. Manual de manejo de frangos de corte agRoss. 2004. [citado 2010 Abr 20]. Disponível em: http://www.aviagem.com.br/pdf_frangos/manual_de_manejo_de_frangos_ross.pdf.

Ávila VS. aspectos importantes a considerar na criação de frangos de corte no período frio. [citado 2011 maio 23] Disponível em: http://www.boletimpecuario.com.br/notes/noticia.php?not=ancora2914.boletimpecuario.

Baracho MS, Camargo GA, Lima AMC. Variables impacting poultry meat quality from production to pre-slaughter: a review. Revista Brasileira de Ciência Avícola 2006; 8(4):201-212.

Beraquet N. Influência de fatores ante e pos mortem na qualidade da carne de aves. Revista Brasileira de Ciência Avícola 1999; 1(2):155-166.

Brasil. MAPA/DAS/DIPOA. Treinamento de agentes de inspeção de aves. Passo Fundo, 2001. 114p.

Cobb-Vantress. Manual de manejo de frangos de corte. Guapiaçú; 2009. 66p.

EMBRAPA. Ambiente de software NTIA, versão 4.2.2: manual do usuário. Campinas: Centro Nacional de Pesquisa Tecnológica em Informática para a Agricultura; 1997. 258p.

Fallavena LCB. Lesões cutâneas em frangos de corte: etiologia. In: Anais da Conferência Apinco de Ciência e Tecnologia Avícolas; 2005; Campinas, São Paulo. Brasil. v.1, p.101-113.

Garcia RG, Mendes AA, Garcia EA, Nääs IA, Moreira J, Almeida ICL, Takita TS. Efeito da densidade de criação e do sexo sobre o empenamento, incidência de lesões na carcaça e qualidade da carne de peito de frangos de corte. Revista Brasileira de Ciência Avícola 2002; 4(1):001-009.

Hildebrand P. Identificação das causas que geram a condenação de carcaças de frangos de corte no abatedouro e análise econômica decorrentes do processo [monografia].Uberaba (MG):Faculdades Associadas de Uberaba; 2005.

Holroyd P. Tendências do mercado de carne de aves e tipo de frango para o novo milênio. Anais da Conferência Apinco de Ciência e Tecnologia Avícolas; 2000; Campinas, São Paulo. Brasil. p.95-109.

Macklin KS, Norton RA, Mcmurtrey BL. Scratches as a component in the pathogenesis of avian cellulitis in broiler chickens exposed to cellulitis origin Escherichia coli isolates collected from different regions of the US, Avian Pathology 1999; 28(6):573-78.

Mendes AA, Nääs IA, Macari M. Produção de frangos de corte. Campinas: FACTA; 2004; 356p.

Moreira J, Mendes AA, Garcia RG, Nääs IA, Miwa I, Garcia EA, Takita TS, Almeida ICL. Efeito da densidade de criação e do nível de energia da dieta sobre o desempenho e rendimento de carcaça em frangos de corte. Revista Brasileira de Ciência Avícola 2001; 3:39.

Mortari AC, Rosa AP, Zanella I, Neto CB, Visentini PR, Brites LBP. Desempenho de frangos de corte criados em diferentes densidades populacionais, no inverno, no sul do Brasil. Ciência Rural 2002; 32(3):493-97.

Olivo R. O mundo do frango: cadeia produtiva de carne de frango. Crisciúma: Ed. Do autor; 2002.

Proudfoot FG, Hulan HW. Effects of stocking density on the incidence of scabby hip syndrome among broiler chickens. Poultry Science 1985; 64(10):2001-3.

Scanlan CM, Hargis BM. A bacteriologic study of scabby-hip lesions from broiler chickens in Texas. Journal of Veterinary Diagnostic Investigation 1989; 1(2):170-3.

Warriss PD, Kestin SC, Brown SN. The depletion of glycogen stores and levels of dehydration in transported broilers. British Veterinary Journal 1993; 149(4):391-8.