

THE EFFECT OF THE SEASON ON INCIDENCE OF FOOTPAD DERMATITIS AND ITS EFFECT ON BROILERS PERFORMANCE

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Abstract

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The aim of the study was to evaluate the effect of the season on incidence of footpad dermatitis and to determine the effect of footpad dermatitis on broilers performance expressed by EPEF (European Production Efficiency Factor). The incidence of footpad dermatitis was evaluated during the year. Daily mortality, weights and feed consumption were observed too. Scoring of the feet was done in slaughterhouse according to six-point scale (0–5) Ask (2010). There were classified between 1200 to 1500 shanks from each flock. To facilitate the evaluation of the feet damage the numbers in scoring groups were summarized as follows: negligible damage (0+1), intermediate damage (2+3) and severe damage (4+5). The highest incidence of negligible damage was found in the summer (34.0%, $P < 0.05$) followed by autumn (13.1%). The most severe damage of the feet was found in the spring (83.2%) followed by winter (72.4%). Only 12% of the feet were negligibly damaged. Almost 70% of the feet were severe damaged. The significant correlation between the feet damage and EPEF was not confirmed ($P > 0.05$). The study showed that footpad dermatitis is a severe problem. However chickens with severe feet damage were able to achieve excellent performance results.

welfare, broiler, footpad dermatitis, feet, season

Footpad dermatitis first became an issue for the poultry industry in the 1980s, but it surely existed long before that time. Even though footpad dermatitis was first described in the 1980s, this period was the beginning of the development of the broiler shanks market and greater attention was being given to feet quality. Recently chicken shanks prices have escalated due to an insatiable demand for high-quality feet in export markets (Shepherd and Fairchild, 2010). Footpad dermatitis is a condition that is characterized by inflammation and necrotic lesions, ranging from superficial to deep on the plantar surface of the footpads and toes. Deep ulcers may lead to abscesses and thickening of underlying tissues and structures (Greene *et al.*, 1985). The ulcers can cause swelling, redness, and heat under the skin and cause the surface area to thicken (Meluzzi *et al.*, 2008). It is likely that footpad dermatitis causes pain and therefore has a negative

effect on bird welfare (Jong, 2012). Animal welfare audits in Europe often use foot, hock, and breast burn-lesions as an indicator of housing conditions and the general welfare of the birds (Haslam *et al.*, 2007). Concerns about the welfare of broilers have lead to a new European Broiler Welfare Directive to be implemented by June 2010 (Ask, 2010). Major factors that have been associated with the occurrence of footpad dermatitis include drinker design (Kyvsgaard *et al.*, 2012); diet composition; house temperature and humidity, as affected by the heating and ventilation system; bedding type and quality; and stocking density. Birds spend most of their lives in direct contact with litter material (Cengiz *et al.*, 2011). Wet litter is the most important factor causing footpad dermatitis. Elevated humidity levels may result in wet and increase the incidence of footpad dermatitis (Shepherd and Fairchild, 2010). The relationship between stocking density and

footpad dermatitis is unclear. Some studies report that higher stocking densities are associated with a greater incidence of footpad dermatitis (Haslam *et al.*, 2007), but other studies suggest stocking density is not a factor. Although having more birds in the house makes litter quality harder to manage, it has been concluded that stocking density itself has little effect on footpad dermatitis as long as adequate house environmental conditions are maintained (Dawkins *et al.*, 2004). In other words, if growers ventilate correctly and keep the litter dry, higher stocking densities do not automatically result in footpad dermatitis issues. Nutrition is considered to be a major factor in the onset of footpad dermatitis along with poor litter conditions. Soybean meal has been investigated as a possible cause of footpad dermatitis because as the diet indigestible carbohydrates (non-starch polysaccharides, or NSP) concentrations increases, gut viscosity increases, resulting in manure that adheres more readily to the footpad of the birds (Shepherd and Fairchild, 2010). Broilers raised on the low-density diet had significantly less incidence of foot lesions compared with the high-density diet due to reduced fecal viscosity from lower soybean meal content in the ratio (Bilgili *et al.*, 2006). Animal factors may also play an important role (Kyvsgaard *et al.*, 2012). It has been suggested that genotype is also a causal factor because it has been shown to affect the prevalence of footpad dermatitis and hock burns (Ask, 2010).

The aim of the study was to evaluate the effect of the season on incidence of footpad dermatitis and to determine the effect of footpad dermatitis on broilers performance expressed by EPEF (European Production Efficiency Factor).

MATERIALS AND METHODS

Incidence of footpad dermatitis was observed on four farms in the year. Hybrid Ross 308 was used on all farms. Chopped wheat straw was used as litter. The stocking density was 39 kg/m² at the end of fattening. On the first farm incidence of footpad dermatitis was evaluated in the whole hall; 500 shanks were analyzed in slaughterhouse from each truck during depopulation the hall. In total 3 550 shanks were graded from seven trucks. On the basis of the results chickens from the middle of the halls were used for footpad dermatitis classification on the other farms, where in total 1 200–1 500 shanks per batch were evaluated. Basic indicators of breeding as daily mortality, weights monitored in seven-day

intervals were observed and expressed as European Production Efficiency Factor. Temperature, humidity and content of CO₂ were observed too. Farms were equipped with feeding technology and nipple drinkers from the Big Dutchman Company. The ventilation was automatic. Heating was provided by Ermaf GP heaters to natural gas on all farms. The feed supplier was also the same on all farms. Broiler chickens were slaughtered in the slaughterhouse Modřice Vodňanská Drůbež, a.s. company. Scoring of the feet was rated in slaughterhouse according to six-point scale (0–5) Ask (2010). To facilitate the evaluation of the feet damage the numbers in scoring groups were summarized as follows: negligible damage (0+1), intermediate damage (2+3) and severe damage (4+5). Generalized linear model for multinomial data (Agresti, 2007) was used for evaluation of significance of underlying factors (season in our case). Pearson correlation was used to judge relationship between EPEF and level of the feet damage. All calculations were obtained from computational system Genstat 15.

RESULTS AND DISCUSSION

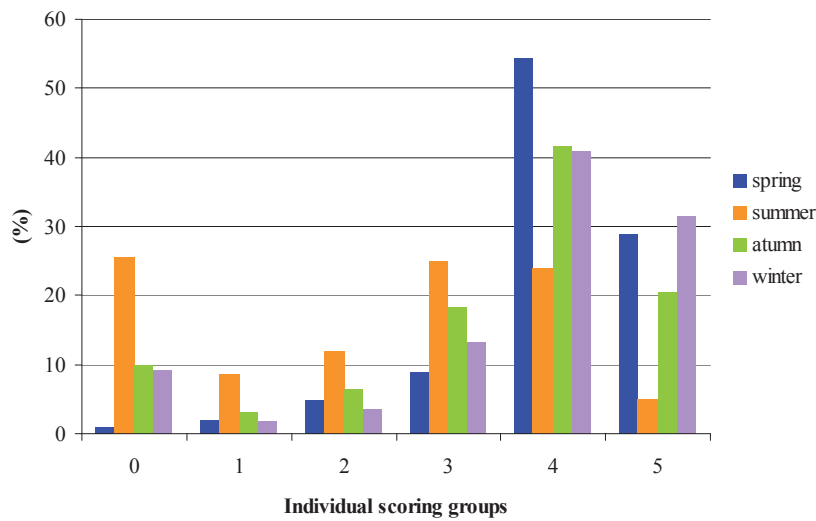
The effect of the season on the feet damage is shown in Tab. I. The highest incidence of negligible damage was found in the summer (34.0%, $P < 0.05$) followed by autumn (13.1%). The most severe damage of the feet was found in the spring (83.2%) followed by winter (72.4%). Generally better quality of the feet was found in the summer and in the autumn. The proportion of the feet in individual scoring groups depending on the seasons is shown in Fig. 1. The highest scoring of the feet into group 0 was in the summer and consequently in the summer the lowest scoring was into group 5. In the spring the highest scoring (> 50%) was into group 4. In the autumn and winter the scoring to all groups was very similar. According Jong (2012) mainly the winter season has been associated with higher levels of footpad dermatitis. Peak of flock footpad dermatitis scores occurred in flocks where 1-d-old chicks were placed in March and December, whereas flocks placed in warm months, between June and August, displayed lower flock footpad dermatitis scores. Meluzzi *et al.* (2008) also reported that the winter season affects the occurrence of footpad dermatitis the most.

Generally the quality of the feet in this study was very low (Fig. 2). Less than 10% of the feet were graded into group 0 and only 12% of the feet were

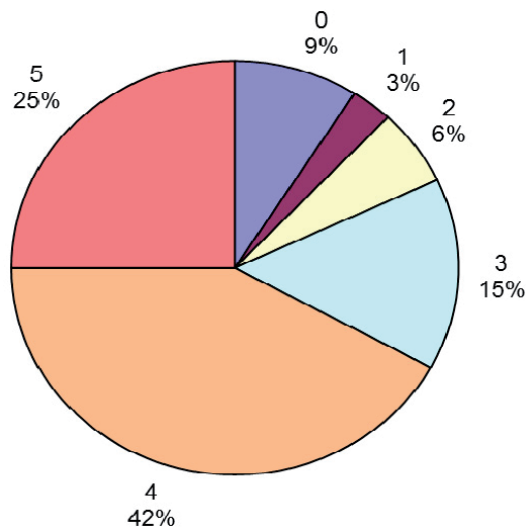
I: The effect of the season on footpad dermatitis damage (%) and EPEF

Damage	Spring	Summer	Autumn	Winter
negligible (1+0)	2.9 ^a	34.0 ^b	13.1 ^c	10.9 ^d
intermediate (2+3)	13.8 ^a	36.9 ^b	24.9 ^c	16.7 ^d
severe (4+5)	83.2 ^a	29.1 ^b	62.0 ^c	72.4 ^c
EPEF	344	346	311	317

a, b – Different superscripts indicate statistical significant difference between seasons ($P < 0.05$)



1: The effect of the season on footpad dermatitis scoring into individual groups (%)



2: Summary of the occurrence of footpad dermatitis in individual groups

negligibly damaged (0+1). One quarter of the feet was scored into group 5. Almost 70% of the feet were in groups 4 and 5 of overall evaluations. It was found that 82% of the feet had moderate to severe damage (groups 3, 4, 5) with ulcers covering 25% or more of the plantar foot.

Incidence of footpad dermatitis in groups 4+5 was lower than 30% only in two batches. These batches took place in August and September. Incidence of footpad dermatitis in group 4+5 was higher than 50% in all other batches. Only in one case, there was proportion of the feet in group 0+1 higher than one third. It can be said that incidence of severe footpad dermatitis was very high in most flocks. Processed shanks with such a large damage are basically unsalable for food purposes.

A more extensive study was conducted by the French. In that study three-point scoring scale was used. They reported that only 10% of chickens were

included into group 0 (Martrenchar *et al.*, 2002). The correspondence with our study was also the fact that main reason of the occurrence of footpad dermatitis was caused by inadequate ventilation mainly in winter months.

These results correspond mainly with poor quality of litter. Most commonly used litter material (cut wheat straw) isn't suitable for fattened chicken. Very soon after the loading of broilers, which have the skin of the feet very delicate, into halls, microscopic penetrating trauma happens. Later, these traumas are infected and gradually lead to inflammation and ulcer formation. This worsens the moisture absorption of litter material. Possibilities to reduce the litter moisture are different. These include the use of exogenous enzymes in feed mixtures to increase the digestibility of non-starch polysaccharides and reduce the water content of the droppings (Nagaraj *et al.*, 2007b).

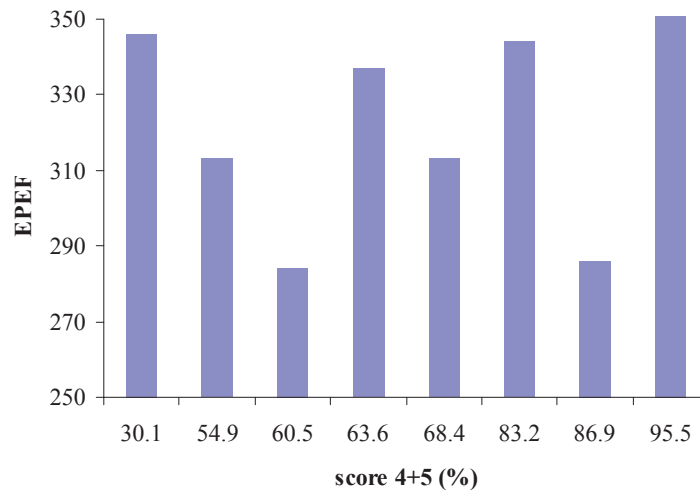
Gouveia *et al.* (2009) showed the negative effect of age on the incidence of footpad dermatitis in chickens. They also observed a lower occurrence of footpad dermatitis in chicken with free range. Pagazaurtundua and Warriss (2006) devoted to effect of different housing systems on damage incidence and found a high variability depending on the used technology. There is the most fattening in closed halls on litter without free range in Czech Republic, within a few exceptions of organic farming.

Footpad dermatitis don't occur only in chickens. Dermatitis in turkeys can be a serious problem particularly in relation of longer fattening period. Wu and Hocking (2011) found that the main cause in turkeys is the quality of litter and problems worsen with age.

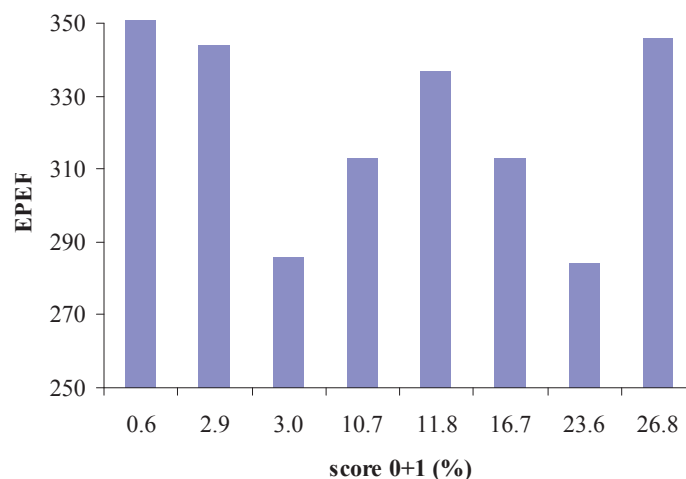
The correlations between the feet damage and EPEF together with p-values are shown in Tab. II. We cannot reject the null hypothesis about linear independency between EPEF and the feet damage intensity for all categories (negligible (0+1), intermediate (2+3) and severe (4+5)). This means

II: The correlation between the feet damage and EPEF

	negligible damage (0+1)	intermediate damage (2+3)	severe damage (4+5)
correlation	-0.184	0.177	-0.025
p-value	0.663	0.675	0.953



3: The relationship between severe damage (4+5) and EPEF



4: The relationship between negligible damage (0+1) and EPEF

that footpad dermatitis did not affect the broilers performance in the study. However Martland (1985) reported that birds with severe lesions may also show reduced weight gain due to pain-induced decreases in feed intake.

That there was not any relationship between the feet damage and EPEF is also shown in Fig. 3 and 4. The highest EPEF (352) was reached in the flock with the most severe feet damage. Almost all the feet were scored into group 4+5 (95.5%) in this flock. On the other side very high EPEF (352 and 344) were reached at flocks with very low incidence of the feet in the groups 0+1 (see Fig. 4).

CONCLUSION

The study showed that footpad dermatitis is a severe problem with a massive incidence significantly affected ($P < 0.05$) by the season. The best quality of feet was found in the summer followed by autumn. Welfare evaluation based on this indicator would be currently very problematic. The damage of the feet had no significant effect ($P > 0.05$) on broilers performance expressed by EPEF.

SUMMARY

The aim of the study was to evaluate the effect of the season on incidence of footpad dermatitis and to determine the effect of footpad dermatitis on broilers performance expressed by EPEF (European Production Efficiency Factor). Problem of footpad dermatitis is investigated mainly because of broilers performance and as an indicator of broilers welfare. Animal welfare audits in Europe often use foot, hock, and breast burn-lesions as an indicator of housing conditions and the general welfare of the birds. The incidence of footpad dermatitis was evaluated at four farms during the year. Hybrid Ross 308 was used on all farms. Basic indicators of breeding as daily mortality, weights monitored in seven-day intervals were observed and expressed as European Production Efficiency Factor. Scoring of the feet was done in slaughterhouse according to six-point scale (0–5) Ask (2010). There were classified between 1200 to 1500 shanks from each flock. To facilitate the evaluation of the feet damage the numbers in scoring groups were summarized as follows: negligible damage (0+1), intermediate damage (2+3) and severe damage (4+5). The highest incidence of negligible damage was found in the summer (34.0%, $P < 0.05$) followed by autumn (13.1%). The most severe damage of the feet was found in the spring (83.2%, followed by winter (72.4%). Better quality of the feet was found in the summer and in the autumn in comparison with the spring and winter. Less than 10% of the feet were classed into group 0 and only 12% of the feet were negligibly damaged (0+1). One quarter of the feet was scored into group 5. Almost 70% of the feet were in group 4 and 5 of overall evaluations. It was found that 82% of the feet had moderate to severe damage (groups 3, 4, 5) with ulcers covering 25% or more of the plantar foot. The correlation between the feet damage and EPEF was not confirmed ($P > 0.05$). The study showed that footpad dermatitis is a severe problem with a massive occurrence. Welfare evaluation based on this indicator would be currently very problematic. However chickens with severe feet damage were able to achieve excellent performance results.

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