Acta fytotechn zootechn, 27, 2024(4): 277-287
http://www.acta.fapz.uniag.sk

Original Paper

Does the Season and Bedding Material Affect the Incidence of Pododermatitis in Broiler Chicken? Analysis of the Situation in Slovakia

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Article Details

Received: 2024-03-18 | Accepted: 2024-09-02 | Available online: 2024-12-31

https://doi.org/10.15414/afz.2024.27.04.277-287

Footpad dermatitis is a multifactorial health problem that occurs in chickens that are raised in suboptimal conditions and is mainly influenced by the choice of bedding material, microclimate, gastrointestinal health, and stocking density. The study aimed to evaluate the current level of occurrence of pododermatitis on poultry farms in Slovakia to identify the assumed factors that most negatively affect the health of footpads. A total of 4219 animals were evaluated on 14 farms, during 41 measurements. We evaluated the influence of different bedding materials (peat, straw pellets, and straw) and the season of the year. Footpads were graded to 0-4 and footpad dermatitis score was calculated. 49 % of the measurements were evaluated above the footpad dermatitis index of 120 points which is the limit set in several countries of Western Europe. Our analysis shows that even in Slovakia there are farms that meet the welfare standards of Western and Northern Europe, but there are also farms where the health of the footpads requires improvement. The effect of the bedding material and the season was significant. The lowest incidence of lesions on footpads was recorded on peat, followed by straw pellets and the highest incidence was on wheat straw. Season of the year also had a statistical effect on the incidence of pododermatitis. The lowest average value was measured in summer and the highest was in autumn. The season had the lowest effect on the peat, on which the best measurements were generally taken.

Keywords: poultry, footpad, bedding, dermatitis, broiler

1 Introduction

The poultry meat market has seen significant growth in recent years, driven by increasing consumers interest in animal welfare. As a living standards and ecological awareness rise, consumers are willing to pay more for products from animals raised in better conditions (Cornish et al. 2019; Boogard, Osting & Bock, 2006). Over the past 61 years, global poultry production has increased by 1456% and in the last 20 years, there has been an overall increase of 87%, while the increase in Western Europe was only 6%. The most significant increase can currently be observed in developing markets, as it is a dietetic suitable and affordable food. While in developed markets there is an increasing interest in poultry from farms with a high level of welfare (Food and Agricultural Organization of the United Nations, 2023). According to the study of Van Asselt et al. (2019) some consumers are willing to accept compromises regarding food safety if it promotes animal welfare.

Intensive genetic selection, optimization of feed recipes and improvements in ventilation equipment and innovation in technology resulted in improvement of technical performance in recent decades. The body weight of the chickens and the proportion of breast muscle continued to increase and feed

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conversion decreased. However, this resulted in an increase in the incidence of leg health disorders (Phibbs, Groves & Muir, 2021). Webster (2008) identified the problems of leg weakness and chronic pain in the heavy strains of broilers as the top priority for change in management practice. He claims that the diseases of bones and joints cause pain in at least one-third of the birds for more than one-quarter of their life. One of the major parameters in the animal welfare of broiler chickens is to prevent footpad dermatitis (FPD). In Western Europe the occurrence of pododermatitis is one of the factors that determines the permitted stocking density (Gussem et al., 2013).

In the early stages of this dermatitis hyperkeratosis, erosions and discoloration of the skin on the plantar part of footpads can be observed. Consequently, these injuries can develop into ulcers and necrotic lesions which cause pain and are gateways for various infections (Berg, 1998). These injuries and lesions cause extreme pain to chickens who walk as little as possible (Gussem et al., 2013).

Birds are in direct contact with litter most of their life. If bedding material is wet, the skin on footpads softens and is much more prone to injuries. In combination with the sharp edges of some commonly used bedding materials, pododermatitis occurs in the later stages of fattening (Andrews and McPherson, 1963). The occurrence of FPD has negative effect on the poultry performance, health, and welfare. If the footpads are injured, chickens walk less, drink less, and eat less, and consequently, their productivity also decreases (Gussem et al., 2013 and Amer, 2020). Healthy and clean chicken paws can also bring more profit to slaughterhouses if they can sell this raw material to Asian countries. The biggest limiting factor is the occurrence of avian influenza in the European Union countries as well as the relevant veterinary permits (Shepherd & Fairchild, 2010).

If the damage level of the footpads is high, the lesions are gateways for infections of limbs, joints, or the entire system. According to research conducted by Thøfner et al. (2019) on broiler parent stock, the risk of systematic infections with gram-positive bacteria is in direct correlation with pododermatitis.

Several factors influence the occurrence of pododermatitis. These include the type of bedding material, microclimate, sex, setting of drinking lines, nutrition, season of the year, or stocking density (Bilgili et al., 2009). Mayne (2005) also identified the moisture of the bedding material as one of the important factors influencing the occurrence of FPD. The second of them was the correct content of biotin in the feed. Kjae et al. (2006) showed in their research that FPD occurs more frequently in females and there is no correlation between FPD and body weight. As susceptibility to FPD is genetically highly heritable and BW is low heritable, breeding to reduce the incidence of lesions is possible. On the other hand, there are almost no lesions in slow-growing hybrids.

The quality of the litter usually deteriorates with the age of the chickens and the humidity of bedding material increases. However, if it is possible to dry the litter during the cycle, the process of lesion formation in chickens can be reversed (Cengiz, Hess & Bilgili, 2011).

The aim of this research was to analyze the effect of bedding material and season on the health of chicken footpads and to analyze current occurrence of footpad dermatitis in Slovakia. We verified the following hypotheses: H1) The use of peat or straw pellets can improve the health of footpads and animal welfare. H2) The effect of the season on the quality of the occurrence of footpad dermatitis will vary according to the type of bedding. H3) The incidence of pododermatitis in Slovakia is higher than indicated by European standards.

2 Material and methods

The observations were done during the years 2021- 2023 on 14 farms. The farms involved in the research were randomly selected on the conditions that they followed basic management practices and allowed us access to the barns. All participating farms were supplied with compound feeds by company De Heus.

On 5 farms, measurements were taken 2 - 3 times during different cycles. A total of 4129 birds were evaluated. Measurements were made on 3 types of bedding material (peat, straw pellets, and wheat straw) and in four seasons of the year (spring, summer, autumn, and winter). Farms with different level of management, technological equipment, bedding material, geographical location, and in different periods of the year were visited. The farm visits associated with the evaluation of the health of the footpads were always carried out when chicken were 25-35 days old, which is the period when it is already possible to observe the lesions on the footpads if there are any. In five cases, lower of higher number of animals than 100 was evaluated mostly for operational reasons on the farm. The smallest number of assessed animals from the barn was 96, and the highest was 110. In all other cases, exactly 100 animals were randomly selected from different parts of the barn. There were always

evaluated chicken from the front, back, and middle part of the barn in the selection. On the farm, there were evaluated 1 to 3 barns according to the differences in the condition of the litter between individual halls.

A report was prepared from each farm measurement. It contained the individual FPD scores. name of the farm, the number of the barn, the date of observation, the age of the chickens, notes on the quality of management, and the condition of the litter, season of the year and type of bedding material used.

2.1 Description of farms

Poultry barns where the measurements were carried out were all closed buildings equipped with inlets, fans, and control units for mechanical ventilation. Barns were one-story and the floor was covered by bedding material. The individual barns were ventilated by various ventilation systems, including cross ventilation, longitudinal ventilation, roof ventilation, tunnel ventilation, or their combination. Some barns were equipped with heat exchangers. However, they were mostly used until the 10th, rarely until the 15th day of the cycle. In the case of tropical weather in summer, evaporative cooling was used at some farms. The environment in the halls was therefore also highly influenced by the outside temperature and humidity which was one of the reasons why we decided to consider the effect of the season. Temperature and humidity were always checked during the measurements. The sum of these values, referred to as the temperature-humidity index, was always in the range of 90-100. This value was in rare cases up to 110, when evaporative cooling running.

Poultry farms evaluated in the research belong to different companies, so management practices differ slightly. However, they are many common parameters. Ad hatched day-old chicks of Ross 308 and Cobb 500 hybrids are purchased. Chickens on farms C and G were slaughtered at an average weight of 2 - 2.2 kg. On all other farms, the slaughter weight was between 2.4 - 2.7 kg with partial unloading of 25 % chickens at bodyweight 1.9 - 2 kg. Stocking density was 15 - 20 chickens per square meter. The maximum load of the barns in kilograms per square meter, which is allowed by the legislation, was always observed. All halls were equipped with automated feeding and watering systems. The drinking lines were equipped with drinking nipples, both with and without drip cups.

2.2 Methodology for evaluating the health of footpads

Two scoring systems for the evaluation of the occurrence of FPD were used for better accuracy and interpretation of results. Individual footpads were firstly classified on a scale from 0 to 4 according to the methodology of the Welfare Quality® Consortium (2009) and later re-classified by BEK nr 757 af 23/06/2010 (2010). Footpads without any changes or damage were given a grade of 0. To grade 1 were sorted footpads in which the integrity between the individual scales of the skin was broken, they were thickened and changed their shape. The largest damage classified in this category was a fine surface crack on the skin if only the keratin layer was damaged. Footpads with larger injured areas were scored 2 but only if epithelium and dermis were intact. On footpads with scores 3 and 4, necrotic lesions and open wounds were already visible from the outside. Open wounds and wounds penetrating deep into the subcutaneous tissue were rated grade 4, and grade 3 was given to minor injuries where the lesions were not sufficiently extensive or deep, but visibly penetrated the subcutaneous tissue. The proportion of footpads in individual categories was calculated. If one leg was in worse condition than the other, worse score was used. We describe this scoring system in Table 1.

In the next step, these data were converted to a scale from 0 to 2. Score 0 was given to animals with healthy footpads. Score 1 represented the footpads with damage to the keratin layer only, and the size the injury being smaller than one-quarter of plantar part of footpad and score 2 footpads with damage extending into the subcutaneous.

The main purpose of this step was to be able to calculate the footpad dermatitis index for each measurement. The footpad dermatitis index was calculated according to Sorin et al. (2013). For this calculation, 100 samples per flock need to be evaluated on a scale of 0-2. Subsequently, the following formula was used to calculate the score:

$$Footpad\ dermatitis\ index\ (100\ birds):\ (total\ number\ with\ score\ 0\ \times 0) + (total\ number\ with\ score\ 1 \times 0{,}5) + (total\ number\ with\ score\ 2\ \times 2)$$

(Sorin et al., 2013)

The measured value of the FPD health status of the individual chicken is referred to as FPD score. The values calculated according to the formula by Sorin et al. (2013) is the FPD index. In the works of other authors, these indicators may be named differently (See Table 1).

Table 1 Overview of scoring systems for FPD

FPD Score (scale 0-4)	FPD score (scare 0-2)	Description
0	0	A healthy footpad without injuries
1	1	Damage to the keratin layer in the form of cracks or places without scales up to 3x3 mm. The scales may be irregular and enlarged.
2		Damage to the keratin layer with an area larger than 3 x 3 mm. The scales may be irregular and enlarged.
3	2	A crack or injury up to 3 x 3 mm in size that penetrates through the keratin layer into the subcutaneous tissue. Blood or necrotic changes may be visible in the wound.
4		A crack or injury larger than 3 x 3 mm that penetrates the keratin layer into the subcutaneous tissue. Blood or necrotic tissue is visible in the wound. Swelling and inflammation are also often present.

2.3 Statistical analysis

The descriptive statistics were calculated for the FPD score for all types of bedding in all seasons as well as for individual types of bedding in all seasons. The difference in mean values of FPD score at 3 different beddings was tested by One Way ANOVA, bedding type was used as a factor. The relation among seasons and FPD score levels was investigated by crosstabulation, difference among seasons was tested by chi-square test. The difference in mean values of FPD score in 4 different seasons was tested by One Way ANOVA, season type was used as a factor.

The descriptive statistics were calculated for the FPD index too, for all 3 types of beddings in all 4 seasons. The effect of season on the FPD index at 3 different beddings was tested by One Way ANOVA, season type was used as a factor.

The relation among seasons and FPD index values was investigated by crosstabulation, and the difference among seasons was tested by the chi-square test. All statistical calculations and tests were performed by IBM SPSS v. 26.

3 Results and discussion

We evaluated a total of 4219 animals. The number of animals on different litter types and in different seasons varied. The most of footpads were scored in winter (1530) and summer (1300), followed by autumn (900) and spring (399). The best 10 values were measured on peat and straw pellets. The lowest FPD index was 25 and the worst 197. An overview of the measurements is captured in Table 2.

Table 2 Overview of results from individual measurements

Farm	Period	Age	Bedding material	Heads	Score 0	Score 1	Score 2	Score 3	Score 4	FPD index
A	Summer	25	Peat	100	68%	24%	2%	6%	0%	**25**
B	Summer	32	Peat	100	59%	26%	10%	4%	1%	**28**
C	Summer	28	Straw pellets	100	35%	42%	20%	1%	0%	**33**
A	Summer	25	Peat	100	67%	16%	5%	10%	2%	**35**
D	Autumn	26	Peat	100	31%	37%	29%	1%	0%	**35**
D	Winter	27	Peat	100	30%	59%	8%	1%	0%	**36**
D	Winter	28	Peat	110	31%	53%	15%	1%	1%	**37**
C	Summer	32	Peat	100	44%	23%	23%	6%	4%	**43**
D	Autumn	26	Peat	100	23%	39%	35%	3%	0%	**43**
D	Winter	27	Peat	100	21%	61%	12%	4%	0%	**45**
E	Summer	28	Wheat straw	100	21%	47%	24%	7%	0%	**50**
G	Spring	28	Wheat straw	96	5%	41%	49%	5%	0%	**51**
C	Winter	28	Straw pellets	103	28%	33%	29%	9%	1%	**54**
E	Summer	28	Wheat straw	100	8%	46%	30%	14%	2%	**70**
G	Winter	25	Wheat straw	100	5%	40%	33%	20%	1%	**79**
H	Summer	35	Wheat straw	100	10%	23%	43%	20%	4%	**81**
CH	Summer	32	Peat	100	32%	19%	12%	27%	10%	**90**
C	Summer	30	Straw pellets	100	10%	29%	29%	25%	6%	**91**
C	Summer	32	Straw pellets	100	18%	23%	24%	14%	20%	**92**
A	Autumn	32	Peat	100	23%	11%	27%	29%	8%	**93**
I	Spring	30	Wheat straw	100	0%	17%	43%	37%	3%	**101**
D	Winter	33	Peat	105	5%	25%	26%	37%	7%	**124**
H	Summer	35	Wheat straw	100	2%	14%	31%	39%	14%	**129**
C	Winter	32	Straw pellets	100	6%	13%	23%	31%	27%	**134**
J	Autumn	25	Wheat straw	100	16%	5%	16%	43%	20%	**137**
K	Winter	27	Wheat straw	102	2%	7%	33%	46%	12%	**141**
CH	Winter	27	Wheat straw	100	2%	20%	12%	45%	21%	**148**
M	Spring	31	What straw	103	0%	5%	35%	51%	9%	**149**
C	Winter	35	Straw pellets	100	5%	13%	11%	43%	28%	**154**
CH	Winter	28	Wheat straw	100	1%	4%	21%	38%	36%	**161**
J	Autumn	25	Wheat straw	100	4%	5%	16%	44%	31%	**161**
C	Winter	29	Straw pellets	100	2%	3%	15%	40%	40%	**169**
E	Winter	34	Wheat straw	100	0%	0%	19%	55%	26%	**172**
G	Spring	26	Wheat straw	100	0%	2%	13%	59%	26%	**178**
CH	Autumn	28	Wheat straw	100	0%	6%	6%	18%	70%	**182**
CH	Summer	32	Peat	100	0%	3%	8%	43%	46%	**184**
CH	Autumn	28	Wheat straw	100	0%	4%	5%	18%	73%	**187**
J	Winter	27	Wheat straw	100	0%	1%	5%	21%	73%	**191**
J	Autumn	25	Wheat straw	100	0%	1%	3%	14%	82%	**194**
L	Winter	33	Wheat straw	110	0%	3%	18%	37%	42%	**195**
A	Autumn	32	Wheat straw	100	0%	0%	2%	16%	82%	**197**
Total				**4129**						

3.1 Effect of bedding material on the occurrence of FPD

The average value of the footpad score of all evaluated animals was 2.14, SD = 1.355. The average value on peat was 1.28 SD = 1,223, 2.05 SD = 1.324 on straw pellets, and 2.70 SD 1.141 on wheat

straw. The influence of bedding material on the incidence of FPD in chickens was statistically significant F (3.4128) = 569.587; P < 0.01.

Many factors affect the occurrence of necrotic lesions on the plantar part of footpads like bedding material, stocking density, sex, the health of the gastrointestinal tract, microclimate, final body weight, and management of drinking lines (Bilgili et al., 2009; De Jong & Van Harn et al., 2012). The condition of the bedding material is crucial for the occurrence of footpads. The first lesions appear on the 14th day and their incidence increases from the 21st day of the chicken`s age when the bedding material is wet. On the other hand, if the conditions are good, the first lesions appear on the 28th day (Taira, et al. 2014).

Compared to health and nutrition, drinking line management has a greater impact on the condition of bedding material. An exception may be the occurrence of coccidiosis. This protozoal disease can deteriorate the condition of the bedding rapidly in few days (Dunlop et al., 2016). Footpads were often evaluated in two or three houses on the same farm at the same time. The effect of other factors was thus minimized. The results of measurements between individual barns were sometimes different. The main reason was probably to manage the ventilation and drinking system.

Kaukonen, Norring & Valros (2017) found that peat has a positive effect on the health of footpads compared with shavings or straw. This desirable ability of this bedding material is relevant only if peat is maintained in good condition. The same peat benefit was observed by De Jong & Van Harn (2012) and Brink et al. (2022). Another bedding material with a positive effect on the reduction of footpad lesions is straw pellets (Kheravii et al. 2017). Aviagen (2018) recommends using straw pellets compared to whole straw because the production process of pellets causes better absorption capacity than straw. There is also lower probability that cakes will create at the top of bedding if pellets are used compared to wood shavings. Our data proves that there is a significant difference between individual bedding materials for the occurrence of FPD. When peat or straw pellets were used, the FPD index and the incidence of footpad damage were lower than when straw was used.

De Beare et al. (2009) evaluated the health of footpads on straw, wood shavings, flax, and peat. A worse score was achieved on shavings than on peat, but it was better than on straw. Wood shavings were not used on the farms included in our research, but we assume that the result would be similar.

3.2 Effect of season on occurrence of FPD

Another analyzed aspect was the season of the year. There are significant changes in environmental factors (humidity, temperature) during the year which affect also the microclimate in barns despite modern barns being equipped with advanced microclimate control units. Therefore, we analyzed the average temperature and humidity in Nitra, 140 meters above sea level (MASL), Banska Bystrica, 549 MASL, and Velka Lomnica, 633 MASL. They were different in every season. Average temperature and humidity were 27 °C and 86 % was in winter, 13°C and 70 % in spring, 19.4°C and 72 % in summer and 11°C and 81% in autumn. That means that more humidity is brought into the barns in winter and autumn compared to summer and spring. These data were obtained from selected meteorological stations through the portal wunderground.com.

The measured values of FPD score, regardless of the type of bedding material, in individual seasons were 2.29 SD = 1.388 in winter, 2.39 SD= 0.907 in spring, 1.5 SD = 1.289 in summer and 2.68 SD = 1.388 in autumn.

The highest average FPD values were on straw in autumn (3.35, SD = 0.999), followed by straw in winter (2.84, SD = 1,017), straw pellets in winter (2.42, SD = 1,289), and straw in spring (2.39, SD = 0,907). The mean FPD values were on straw in summer (1.77, SD = 1,042) and straw pellets in summer (1.56, SD = 1.207). On the contrary, the measured values were very balanced on the peat. Interestingly, the worst FPD score values were in autumn (1.36, SD = 1.071), followed by summer (1.29, SD = 1.434), and the lowest values were measured in winter (1.21, SD = 0.967). Fig. 1 expresses the average level of damage to footpads during individual seasons and with the use of different bedding materials.

It can be concluded that the effect of the season on the incidence of pododermatitis is statistically very significant $F_{(3.4128)}$ = 176,503, P < 0,001. While the effect of season on FPD using wheat straw was significant $F_{(3.\ 2110)}$ = 218,24, P < 0,001, when using peat, the effect was not statistically significant $F_{(2.1314)}$ = 1.279; P > 0.05.

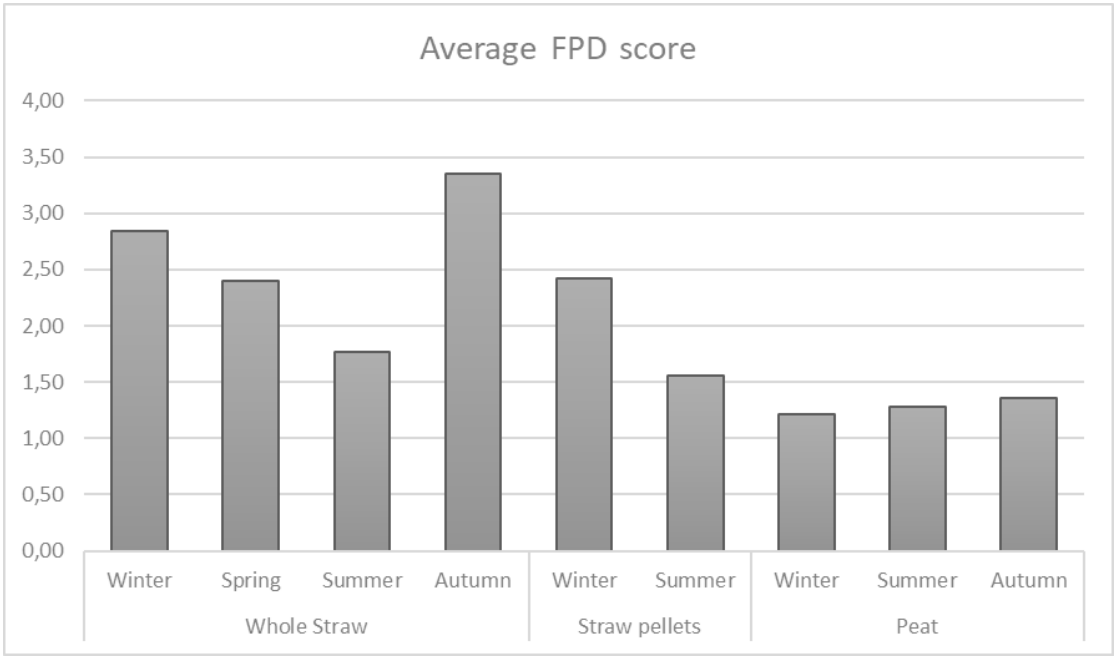

Fig. 1 The influence of season and bedding material on the severity of FPD

It follows from these data, that the achievement of healthier footpads using peat regardless of the season is easier compared to other bedding materials. Nevertheless, it was recorded that even if peat for used, a higher incidence of FPD is possible under the influence of external factors like poor management of ventilation or leaky drinking lines.

Musilová et al. (2013) demonstrated in their study that there is a statistical difference in the effect of season on the occurrence of lesions. The most severely injured footpads were observed in spring (83.2 %) and winter (72.4 %). Fewer injuries were observed in spring (62 %) and the least in summer (29.1 %). In our study, if we compare only the values measured on wheat straw, the most injured footpads were observed in autumn, followed by winter, spring, and summer. Table 3 represents the exact values. We used a different scoring system than Musilová et al. (2013), but the values of 3 and 4 should be comparable to the severe damage they refer to in their work. In that case, our values measured in the summer of 25% (our data) vs. 29.1 % (their measurement) are at a similar level. The values for the other seasons were different (46% for spring, 54% for winter, and 90% for autumn).

Table 3 The proportion of injuries on chicken footpads on wheat straw during different seasons of the year (evaluation scale: 0-4)

Season	Score 0 [%]	Score 1 [%]	Score 2 [%]	Score 3 [%]	Score 4 [%]
Spring	1	16	34	37	9
Summer	10	33	32	20	5
Autumn	1	16	35	38	9
Winter	4	17	24	26	27

If the results of our measurements and the research of Özel and Bozkurt (2023) are compared, the lowest occurrence of FPD was identically in the summer period. However, they observed the highest incidence in winter, while in our environment it was in autumn. However, there are vast differences between our measurements and theirs. While the FPD index calculated from their data was 31.5 in winter, 28.3 in spring, 16.3 in summer, and 25 in autumn, our values were 90.7 in winter, 82.9 in spring, 56.55 in summer, and in autumn 116.2. The difference in the weighted average of the FPD index between our measurements is 59.655 points. As our methodology was similar, we assume that the reasons for such significant differences were different climatic conditions between our regions and

the level of farm management. Meluzzi et al. (2008) also observed a significant increase in FPD in winter compared to summer during their research conducted in Italy and Berg (1998) concluded that in Sweden, the incidence of FPD was the highest compared to other periods.

3.3 FPD index and analysis of the current occurrence of FPD in Slovakia

From the measured values of the pododermatitis score, FPD index was calculated so it could then be compared with legislative standards. The influence of the season and bedding material on the FPD index is shown in Fig. 2.

On straw the FPD index was higher throughout the year (82, 120, 155, 176), straw pellets achieved medium values (72,128), and the best results (lowest FPD value) could be achieved on peat (57, 60, 67). The average value of the FPD index was 109.55 (SD = 59.160). The range of measured FPD index during different periods of the year was wider for straw compared to peat. The average value of the FPD index measured in autumn on straw was 176, compared to 82 in summer. On peat bedding, the best values were measured in autumn 57 and the highest in summer 67. The average value of the FPD index was the lowest in summer 72.92 (SD = 45.794), followed by spring (119.54; SD = 55.61), winter (122.52, SD = 57.109), and autumn (136.39, SD = 64.274).

The influence of bedding material and the season without the values of specific footpad scores but with the use of the calculated FPD index was analysed. The difference between individual seasons was statistically significant $\chi 2 = 8.878$, $P < 0.05$. However, when the individual seasons were compared with each other, only the difference between winter and spring ($P < 0.05$) and summer and autumn ($P < 0.05$) were statistically significant. Between winter and autumn, spring and summer as well as spring – autumn, the difference was not significant ($P > 0.05$). The difference between peat and straw as well as peat and straw pellets was statistically significant ($P < 0.05$), while the difference between straw pellets and straw was not significant ($P > 0.05$). These measurements show that the use of the FPD index is applicable for comparisons, but the use of a specific FPD score is more accurate.

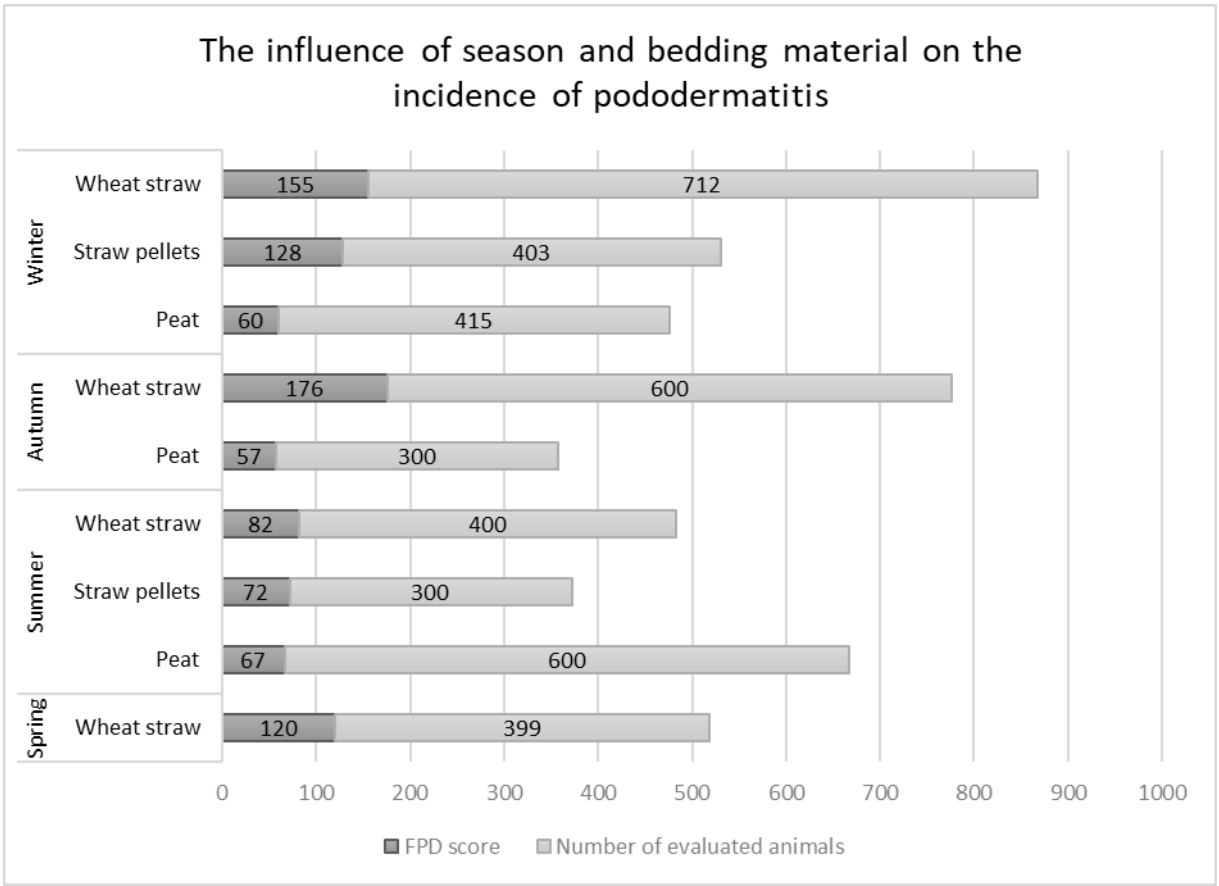

Fig. 2 The influence of season and bedding material on FPD index

The average value of the FPD index calculated on peat was 64 on straw pellets 104 and on straw 140. It follows from these data that the best health of footpads was achieved when peat was used as bedding material. However, even peat was not enough for good footpad health, if the management of drinking lines and ventilation was not appropriate. On average, a worse score than on peat but better than on straw was achieved on straw pellets which proves the research of Kheravii et al. (2017).

In neither Slovakia nor the Czech Republic there are no legal limits for footpad dermatitis score measured on the farm or in slaughterhouse. In Finland, they score 100 footpads from every shipment to a slaughterhouse and calculate the footpad dermatitis index (score). If this index is above 80, this fact is reported to the regional veterinary administration (Pohjola, Perko-Mäkelä & Neuholz, 2017). In the Netherlands, these criteria are less strict. Veterinary administration is informed if an index is higher than 120. The farm is subsequently monitored. If the violation is repeated, they are penalized, they must reduce stocking density and legal action can be taken against them (Tondeur et al., 2019). Our research shows that only 15 of 41 (37 %) measurements were scored below 80 points and 21 (51%) below 120. So, we can consider the remaining 49% as unsatisfactory from the welfare point of view.

In our opinion, the reason for such a high occurrence of pododermatitis in our area is that farmers are not motivated in any way to reduce its occurrence (reduction of stocking density, alternative bedding, new water supply lines). According to Gussem et al. (2013), monitoring the health of footpads is a reliable tool to control stocking density.

Berg (1998) estimated an occurrence of mild lesions at the time of slaughter in Sweden at 10-35% and severe lesions at 5-10%. According to our data, the incidence of mild lesions was 40.9% and severe lesions had 40.4% of the birds in Slovakia between 25-35 days of age.

4 Conclusions

In our study, we managed to evaluate the current state of occurrence of pododermatitis in Slovakia. The obtained values indicate that the situation on 49% of the farms we visited requires radical improvement. At the same time, however, it proves that with the application of proper management practices, achieving results that are standard in Western Europe is also possible in our conditions.

Both factors, litter material and season of the year, whose influence on the incidence of FPD we assessed, found to be significant. We observed the lowest incidence of pododermatitis on peat, followed by straw pellets, and the highest incidence on straw. The choice of bedding material has a major impact on the health of chicken footpads, but other environmental factors are also important.

We have demonstrated the different influences of the season on different types of litter. The influence of the season was also proven to be very significant ($P < 0.001$), especially if straw was used. For peat or pellets, the range of measurement results was much lower compared to straw. When straw was used as bedding material, the difference was significant ($P < 0.05$), but not if peat was used ($P > 0.05$). That means that the use of peat reduces the impact of weather on the health of footpads. Even though rarely individual measurements on peat reached higher values of the FPD index (farm CH, 184), on average the average value was kept between 57 and 67. We can assume that the widespread use of alternative bedding such as peat could help the welfare of chickens raised in Slovakia.

All the proposed hypotheses were confirmed. H1 and H2 were confirmed fully and H3 only partially. H1: The use of pelleted straw or peat had a positive effect on the health of the runners and the welfare of the animals. H2: The effect of the season on peat was lower than it was for other bedding materials. H3: There are farms in Slovakia that can maintain the health of footpads according to European standards. However, there are also many where the situation requires improvement.

Acknowledgments

We thank all the poultry companies that participated in our research and made it possible for us to do it and company De Heus for enabling their employee to study while fulfilling his work duties.

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BEK nr 757 af 23/06/2010 Bekendtgørelse om hold af slagtekyllinger og rugeægsproduktion