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Performance of Broilers and Occurrence of Pododermatitis as Influenced by Different Flooring and Littering Materials

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Abstract: ***The study was conducted to evaluate the growth performance of broiler as affected by the occurrence of pododermatitis as influence by different floor surface and litter material. A total of one hundred fifty (150) broilers were used and was distributed into five (5) treatments. The experiment was laid out using the Completely Randomized Design (CRD) with the following treatments: 1- bamboo slatted floor; Treatment 2- litter floored with saw dust (4 -5 inches thick); Treatment 3- litter floored with rice hull (4-5 inches thick); Treatment 4 – (1" x 1") amazon screen; Treatment 5 – cage floored with (1/ 2" x 1 /2") wire mess. Insignificant result was observed on the body weight, the total gain in weight, feed conversion ratio, dressing percentage with giblets and the cut-up parts of the broilers. Significant result was observed on growth rate, cumulative feed consumption and feed conversion efficiency. Broilers raised on an amazon screen was the most efficient in converting feeds into meat over those broilers raised in a cage with bamboo slat flooring, sawdust litter, rice hull litter and wire mess. Significant differences among treatment means were observed on the occurrence of pododermatitis. Broilers raised on a bamboo slatted floor has the most score of 1.53 to 3.33 which means a lesion of 25% to 50% and above. broilers raised on a wire mess flooring obtained similar degree of lesion with the broilers raised on a bamboo slatted flooring with a degree of 50% and above. The least lesion appeared on broilers raised on sawdust with a degree of lesion of 25% (score 1 to 1.19).***

Keywords: Pododermatitis; Littering Materials

1. Introduction

To obtain maximum broiler production potential, management of the poultry house is essential. One of the management practices is the proper maintenance of poultry litter. Before arrival of chicks in the house, the floor is covered with the litter material. The quality of litter significantly influences the overall performance and ultimately the profit. Litter plays a vital role in absorbing the fecal moisture, promotes drying by increasing surface area of the house floor, insulates chick from cooling effects of the ground and provide a protected cushion. It helps to conserve heat by insulation and provide supplemental heat through fermentation by feacal microorganisms. Litter receives droppings and absorbs moisture from faeces and respiratory processes. It provides a warm, soft and spongy surface for optimum comfort of the birds. The litter should be easily available with a maximum moisture absorbing capacity, be non-toxic, economical and porous. Proper level and depth of litter is important to avoid high bacterial load and unhygienic conditions resulting in harmful gases which keep the birds in stress, causes insects problems (particularly flies), soiled feathers, footpad lesions and breast bruises or blisters.. These materials have been used successfully due to their high moisture absorbing capacity (Haffez*et al*, 2009).The purpose of using litter on floor is to absorb moisture from birds, dropping to keep floor reasonably dry and to ensure comfortable condition for birds. It also gives birds a suitable medium on which feeding, watering and other management practices are carried out. (Monira, *et al*, 2002).

The quality of chicks, feed and water are all of great concern to broiler producers, but quality of litter in broiler houses is seldom given sufficient emphasis. This is unfortunate because birds are in continuous contact with litter. Litter conditions significantly influence broiler performance and, ultimately, the profits of growers and integrators. There are ways an animal raisers would like to find especially when it comes to making a farming system efficient, broiler raising is one with a product mostly consumed but sometimes their market value is affected by blemishes, scratches, and the worst is lesions which would lead to partial or complete condemnation of carcasses complemented by unsuitable litters and flooring materials.This study by using different flooring and littering materials would try to investigate the occurrence of *Pododermatitis* as it affects the performance of broilers.

2. Methodology

The Experimental Cages

Three of the fifteen experimental cages flooring were made up of slatted bamboo, three were floored with 1 x 1 amazon screen, three with ½ x ½ wire mess, another three cages were floored with saw dust with 4 to 5 inches thickness and the remaining three were litter floor of rice hull beddings (4-5 inches thick).

Procurement of the birds

A total of one hundred fifty Minerva(150) broilers chicks were purchased from Math Breeder Farm at barangay Burgos, Malolos, Bulacan, through the mediation of Belstenn Veterinary Supply, Roxas, Isabela. They were brooded for one week before they were distributed to their respective pens.

Environment Sanitation and Hygiene

All of the cages and the brooder cages used in this study were cleaned and sprayed with disinfectant a week before the start of studyto prevent the occurrence of disease cause by harmful microorganism during the study. Chicken dungs were regularly removed out of the experimental site to maintain cleanliness. Dead birds were disposed by burying in the ground.

Feeding Management

A formulated ration (Table 1) was provided to all the experimental birds. It was given until they reached the average weight of 1.5 kilogram. For the first week the feed was placed on an old newspaper. For the rest of the experimental period a plastic feeder for the remaining weeks of the study was used. Adlibitum system was practiced throughout the study.

Table 1: The Composition and calculated nutrient analysis of homemixed ration used in the study

Ingredients	Parts
Corn	58
Rice bran	27
Fish meal	5
Soybean meal	5
Limestone	1.3
Antioxidants	1.5
Molasses	1
Dicaphos	0.5
Mint/Vit premix	0.5
Methionine	0.1
Salt	0.1
TOTAL	100
Calculated analysis	
Crude Protein	20.24
ME (Kcal)	2973.4
% Ca	0.85
%P	0.43
% Lysine	1.14
% Methionine	0.42

Occurrence of Pododermatitis

The initial occurrence of pododermatitis was taken before the birds were distributed to their respective cages. The percentage of occurrence was determined weekly per treatment. Twenty feet per replication were assessed for pododermatitis lesions. Pododermatitis lesions were evaluated usingthe methodology proposed by Martrenchar (2001).Lesions were scored as: 1, lesion covers less than25% of the footpad; 2, lesion covers 26-50% of thefootpad; and 3, lesion covers more than 50% of the footpad (Figure 2).

Scale	Score	Description
0.1-1.0	25%	Slightly affected
1.1-2.0	50%	Moderately affected
2.1-3.0	75%	Severely affected

3. Results and Discussion

Body Weight

The initial and weekly body weights of the broiler chickens raised under caged system are shown in Table 2. Insignificant result was observed on the initial body weight of the broilers. Significant differences was observed on the first and second week of the study. Broilers raised in a cage with sawdust litter (T_2), rice hulls litter (T_3) and amazon screen flooring (T_4) did not show any significant difference but not with those broilers raised in a cage with flooring material of bamboo slat (T_1) and wire mess.

Table 2: Initial and Weekly Body Weight of Broilers(g).

Treatment	WEEKLY BODY WEIGHT (grams)						
	Initial	1st	2nd	3rd	4th	5th	6th
T_1 – Bamboo slat	63.67	177.97[b]	386.11[b]	694.44	1190.00	1491.00	1775.00
T_2 – Sawdust litter	63.67	184.75[a]	427.78[a]	736.36	1176.00	1496.00	1765.00
T_3 – Rice hull litter	62.67	183.93[a]	411.11[a]	700.00	1146.00	1471.00	1833.00
T_4 – Amazon screen	63.33	183.93[a]	416.67[a]	727.78	1186.00	1535.00	1863.00
T_5 – Wire mess	63.33	179.50[b]	419.44[a]	711.11	1196.00	1487.00	1787.00
ANOVA	Ns	**	*	ns	ns	ns	ns

The result implies that the body weight was affected by the type of litter/ flooring on the first 2 weeks of the study. It shows that broilers raised in a sawdust litter (T_2) has the highest body weight which is in conformation with the study of Monira, *et al* (2002). which he found out that broilers reared on sawdust gained the highest body weight than those on wheat straw, sugarcane bagasse and rice hull.

Gain in Weight

The weekly gain in weight of broilers raised in a different flooring materials was shown in Table 3.Results of the study showed insignificant differences ($P<0.01$) on gain in weight was observed among the treatments on the first and third week of the study. On the second week of the study, a significant result at 1% level was observed. Broilers in T_3 (rice hull litter) significantly gained higher weight than those broilers in T_2 (sawdust litter), T_4 (Amazon screen), T_5 (wire mess) and T_1 (Bamboo slat) However, broilers in T_2, T_4 and T_5 are comparable with each other but not in T_1.Significant at 5% level was observed on the fourth week of study. Broilers in treatments 2,3 and 4 are comparable with each other but not with those broilers in treatments 1 and 5. However, broilers in treatments 1 and 5 did not show any significant difference. The same trend of significance was observed on the fifth week of the study. Broilers in treatments 3 and 4 were comparable with each other but significantly higher gain in weight over those broilers in treatments 1, 2 and 5. However, broilers in treatments 1 and 2 did not differ with each other. Furthermore, broilers in treatment 5 had the lowest gain in weight among treatments. On the sixth week of the study, broilers raised in (T_4) Amazon screen and T_3 rice hull litter significantly had the highest gain in weight over those broilers in T_1, T_2, and T_5.

Table 3: Average Weekly Gain in Weight of the Broilers Raised in a Cage with Different Flooring Materials (g)

Treatment	WEEKLY GAIN IN WEIGHT (grams)						TOTAL GAIN
	1st	2nd	3rd	4th	5th	6th	
T_1	114.31	208.14^{c}	308.34	495.56 ^{a}	301.00^{b}	284.00^{b}	1,775.00
T_2	121.08	243.03^{b}	308.59	439.64^{b}	320.00^{,b}	269.00^{b}	1,765.00
T_3	121.27	288.89 ^{a}	288.89	446.00^{b}	325.00^{a}	362.00^{a}	1,833.33
T_4	118.61	234.722^{b}	311.11	458.22^{b}	349.00^{a}	328.00^{a}	1,863.33
T_5	115.83	239.944^{b}	291.67	484.89^{a}	281.00^{c}	300.00^{b}	1,777.33
ANOVA	ns	**	ns	*	**	**	Ns

*Significant
** highly significant
Note: means within column having common letter are not significant

The results revealed that broilers raised on rice hull litter and amazon screen significantly affect the gain in weight of the broilers. Consistently, those broilers raised on a sawdust litter significantly have higher gain in weight. This is in agreement on the study of Shakila and Naidu (1998), stating that body weight gains were significantly lower on sawdust while comparing broiler performance on groundnut hulls, rice husks and chopped straw or sawdust.

Percentage Rate of Growth

The weekly growth rate of broilers raised on a different litter/flooring materialsis presented in Table 4. As revealed on the Analysis of Variance (ANOVA), significant at 1% level was noted on the weekly growth from the first week up to the end of the study.Broilers raised on a rice hull consistently had the higher growth rate over the broilers raised on bamboo slat, sawdust, Amazon screen and wire mess.

Table 4: Average Weekly Growth Rate of Broilers Raised in a Cage with Different Flooring and littering Materials

Treatment	WEEKLY GROWTH RATE (%)					
	1st	2nd	3rd	4th	5th	6th
T_1	96.41^{a}	73.79^{c}	57.07^{a}	22.45^{a}	22.45^{b}	17.39^{a}
T_2	97.48^{b}	79.35^{a}	53.01^{c}	23.95^{b}	23.95^{b}	16.50^{a}
T_3	98.41^{b}	76.36^{b}	51.99^{c}	24.84^{c}	24.84^{a}	21.91^{b}
T_4	96.41^{b}	78.42^{a}	54.37^{c}	25.65^{c}	25.65^{a}	19.30^{a}
T_5	95.27^{a}	80.12^{a}	51.59^{b}	21.02^{a}	21.02^{b}	18.43^{a}
ANOVA	**	**	**	**	**	**

** highly significant
Note: mean within column with common letter are not significant

This results shows that litter material significantly affect the growth rate of the broilers. Since broilers can scavenge on the rice hull, there is a possibility of picking some substances that can cause them to grow faster than the other broilers from other cages with different litter material. Awojobi*et al* (1999) had similar findings and they attributed this to the presence of unidentified growth promoting substances in rice hull.The decreasing pattern of growth rate follows the standard growth rate pattern in broiler chickens under intensive systems of management with high growth rates during the first two weeks and gradually decreases towards maturity. The result of this study is similar with the findings of Reyes (2004) and Dagaas (1989) that growth rate diminishes as chickens grow older.

Feed Consumption

The weekly and cumulative feed consumption of the different of broilers raised on a different flooring and littering materials are presented in Table 5. The Analysis of Variance (ANOVA) revealed insignificant differences among treatments in terms of their feed consumption for the first, second, 4th and 6th week of the study. However, on the third and fifth week of the study a significant result was observed. Broilers raised on a sawdust litter (T_2) significantly consume the least amount of feeds than those broilers raised on rice hull (T_3), bamboo slat (T_1), Amazon screen cumulative feed consumption of the broilers, a significant result at 1% level was observed. The broilers raised on an Amazon screen significantly consume the lowest amount of feeds (3924.72 grams) while those broilers raised on sawdust consume the greater amount of feeds (4,280.17 grams).The result is in contrast on the study of Monira (2002) who found out that feed intake of the birds reared on different litter materials was more or less similar($p>0.05$), although birds on sawdust consumed the highest amount of feed.

Table 5: Average Weekly Feed Consumption of Broilers Raised in a Cage with different Flooringand littering Materials (g)

Treatment	WEEKLY FEED CONSUMPTION (grams)						
	1st	2nd	3rd	4th	5th	6th	Feed Consumption
T_1	376.25	478.67	572.50^{a}	770.56	889.44^{b}	1048.61	4128.52^{b}
T_2	369.61	473.33	559.44^{b}	751.07	1007.50^{a}	1041.97	4280.17^{a}
T_3	369.72	476.67	565.55^{c}	744.44	920.00^{b}	1043.33	4119.72^{c}
T_4	362.52	470	587.22^{a}	746.11	838.33^{b}	923.33	3924.72^{d}
T_5	376.67	476.67	579.44^{a}	741.94	874.72^{b}	969.17	4015.80^{b}
ANOVA	ns	Ns	*	ns	**	ns	**

ns- not significant
*significant
** highly significant
Note: means within a column with common letters are not significant

Feed Conversion Ratio and Efficiency

The feed conversion ratio and efficiency of broilers raised on a cage with different flooring and littering materials are presented in Table 6. It was noted that insignificant difference among treatments were observed in terms of feed conversion ratio broilers. This means that the feed conversion ratio of broilers did not affect by the different flooring and littering materials used. This finding is in congruence to the findings of Onu, *et al*, (2011) who found out that feed conversion ratio (FCR) of young broiler chicks reared on the three litter materials (wood shaving,saw dust, rice husk) did not differ significantly (P>0.05).In terms of the feed conversion efficiency, significant differences among treatments were observed. Broilers raised on an amazon screen was the most efficient in converting feeds into meat over those broilers raised in a cage with bamboo slat flooring, sawdust litter, rice hull litter and wire mess. The result on feed conversion efficiency was statistically similar in birds reared on different types of litter was in agreement with Hussain *et al*. (1996), and Malone et al. (1991). It was tended to improvefeed conversionefficiency on Amazon screen followed by the rice hull, wire mess, bamboo slatted floor and sawdust litter.

Table 6: Average Feed Conversion Ratio (Kg) and Efficiency (%) Broilers Raised in a Cage with Different Flooring and Littering Materials

Treatment	Feed Conversion Ratio (kg)	Feed Conversion Efficiency (%)
T_1	2.42	41.37[a]
T_2	2.52	39.74[b]
T_3	2.33	42.96[a]
T_4	2.11	45.77[c]
T_5	2.35	42.61[a]
ANOVA	ns	**

ns = not significant
** = Highly Significant
NOTE: Means with common letters showed are not significantly different using LSD.

Dressing Percentage, Liver and Pancreas Weight

The dressing percentage with and without giblets are shown in Table 7.Insignificant differences among treatments were obtained in terms of the dressing percentage with giblets which ranged from 81.32 to 85.23 percent. Significant was obtained in terms of the dressing percentage without giblets. Those broilers raised on a bamboo slatted floor, sawdust litter and rice hull litter were comparable to one another but significantly higher dressing percentage without giblets with those broilers raise on an amazon screen floor and wire mess . However, broiler raised on amazon screen floor and wire mess floor did not differ significantly.This means that the dressing percentage without giblets of broilers was affected by the type of flooring in their cages.

Table 7: Dressing Percentage with and without Giblets (%), of Broilers Raised in a Cage with Different Flooring and Littering Materials

Treatment	Dressing Percentage	
	With Giblets	Without Giblets
T_1	85.23	73.41[a]
T_2	84.91	71.70[a]
T_3	85.41	71.72[a]
T_4	81.32	68.34[b]
T_5	82.44	67.79[b]
ANOVA	ns	*

ns = Not significant
* = Significant
NOTE: Means with common letters showed are not significantly different using LSD.

Occurrence of foot pod dermatitis as influenced by floor and litter Materials

The weekly occurrence of pododermatitis in broilers raised on a different flooring and littering materials was shown in Table 9. Result of the study revealed significant differences (P<0.01) among treatments means from first week up to the end of the study. Consistently from the first week up to the fifth week of the study, broilers raised on a bamboo slatted flooring has the most score for pododermatitis followed by wire mess

Table 9: Weekly Occurrence of Pododermatitisof Broilers Raised in a Cage with Different Flooring and Littering Materials (%)

Treatment	OCCURRENCE OF PODODERMATITIS (%)						
	1st	2nd	3rd	4th	5th	6th	Average Occurrence
1	15.00*	17.00*	22.00*	27.00**	43.00**	55.50***	29.92**
2	4.00*	4.75*	5.00*	6.25*	10.00*	14.25*	7.38*
3	4.00*	8.50*	12.50*	17.00*	19.50*	30.75*	15.38*
4	2.50*	4.75*	6.75*	8.50*	9.50*	14.50*	7.75*
5	8.25*	9.25*	21.25*	24.50*	33.75**	54.50***	25.25**

Scale	Score	Description
0.10-1.00	25 %	*Slightly affected
1.10-2.00	50 %	**Moderately affected
2.10-3.00	75 %	***Severely affected

This result was in contrast with the study of Andrews *et al* (1994)who revealed that broilers reared on bamboo and plastic had lower incidence of breast blister and abrasion, The least degree of lesion appeared on broilers raised on sawdust with 25% infection on the foot pod (score 0.10 to 1.00) on the first week up to the end of the study. The most score of pododermatitis in all treatments at the end of the study was noted in T1 followed by T_3, T_5, T_4 and the least was in T_2. Based on the degree of lesion, the least was observed in treatment 2, treatment 4, and treatment 3 with a 25% degree of lesion. Treatment 5 and 1 had a 50% degree of lesion.Zulkifli and SitiKhatijah (1998) reported that the incidence of breast blister and foot pad lesions were similar in broilers reared on floors of wire mesh and plastic mesh.

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