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Full Length Research Article

Effect of Different Types of Litter Material on the Performance and Carcass Yield of Broiler Chicken

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Abstract

The present study, entitled "Effect of different types of litter material on the performance and carcass yield of broiler chicken," was conducted with 120-day-old, straight-run broiler chicks (Cobb-400), which were assigned to four types of litter material, namely; paddy husk (T_1), sawdust (T_2), wood shavings (T_3) and chopped paddy straw (T_4) and reared under standard management practices. After the completion of 21 days, each group was replicated five times in a Completely Randomized Design. Statistical analysis revealed a significant effect of litter types on final body weight and feed conversion efficiency. Body weight was found to be significantly ($P<0.05$) higher in groups T_2, T_3 and T_4 as compared to T_1 reared on chopped paddy straw. The best FCE was observed in groups reared on sawdust and wood shavings. Weight gain and feed intake were unaffected by different types of litter. Numerically, the highest live ability (100%) and best performance index, higher carcass yield, and dressing percentage were observed in birds reared on wood shavings. The interaction of litter type and days had a significant effect on pH, moisture per cent and bulk density over time. The least cost of production, higher net profit, and benefit-cost ratio were observed in group T_3. Hence, it was concluded that birds reared on wood shavings (T_3) performed better in terms of body weight, feed efficiency, live ability, performance index, carcass traits, net profit, and benefit-cost ratio as compared to those reared on other litter materials. Based on the above findings, wood shavings may be considered a viable unconventional litter material for optimum broiler production.

***Key words*:** Litter material, Broiler, Physical and chemical property, Moisture, pH, Carcass

Litter is defined as the bedding material that is used to cover the floor for rearing birds under a deep litter system. Broiler chickens are usually raised on a floor using different types of litter material [1]. Poultry litter is a mixture of poultry excreta, spilt feed, water, feathers, and material used as bedding material in poultry operations [2]. Litter material plays a crucial role in the rearing of poultry farms for better production and low mortality [3]. The purpose of using litter on the floor is to absorb moisture from bird's droppings so that the floor remains dry and ensures a comfortable environment for birds. It helps to reduce the contact of birds with the floor and their droppings, provides considerable welfare, and allows their normal behaviours such as soil scratching, dust bathing, and searching for food [4]. It also gives birds a suitable medium on which feeding, watering, and other management practices can be carried out efficiently. Various types of litter materials are used in different countries depending on their availability. The common types of litter used in poultry houses throughout the world are sawdust, rice husk, sugarcane pulp, sugarcane bagasse, chopped straw, paper mill by-products, sand, wood shavings, corn cobs, oat hulls, peanut hulls, dried leaves, coffee husk, and other dry absorbents, low-cost organic materials having different physical and chemical properties [5].

Litter quality is another concern in broiler production because it is associated with performance, health, carcass quality, and the welfare of broilers [6]. In broiler production, the quality of chicks, feed, and water to be used are some of the factors that have always received more attention than the quality of litter materials used to rear them. However, litter quality is considered the origin of environmental and management problems in the commercial poultry industry [7]. Hence, litter quality, as an environmental factor, is an important and integral element in providing the proper environment inside the poultry facilities to achieve the efficient productive and reproductive performance of poultry. Therefore, litter material should have desirable properties like low moisture and pH, the capability of drying quickly, being dust-free, soft and compressible, free of any contaminants, absorbent and buoyant, having thermal conductivity to act as insulation, and not cake [8].

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The physical and chemical properties of litter material vary with the type of litter, and the effects of different litter materials on poultry are related to their properties [9], which also determine their potential use as poultry bedding material. Substrates that remain dry throughout the production cycle are favorable for the activity of chickens and promote better leg health. On the other hand, litter that is too dry and dusty can also lead to problems such as dehydration of new chicks, respiratory disease, and increased bird loss. The condition of litter plays an important role in maintaining a proper environment within poultry houses and enhancing bird performance. The two factors that influence litter conditions most are bird droppings and moisture. Wet litter is also the primary cause of ammonia emissions, one of the most serious environmental factors that affect broiler production and increase the risk of pathogen growth [10]. Controlling litter moisture is the most important step in avoiding ammonia problems. Ideally, litter moisture should be maintained between 20 and 25 percent. High humidity, warm temperatures, and a high pH favour the proliferation of pathogens in the litter [11]. Litter material with low pH levels has been reported to be advantageous due to the fact that in litter with a high pH, the conversion of uric acid to ammonia is reduced Moore *et al*. [12] and Musa *et al.* [13]. The quantity of litter material required for poultry rearing is usually calculated based on the depth and height of the litter to be maintained and the area to be covered. The bulk density of litter material helps determine the requirements for various litter materials. The lower bulk density of material shows high porosity, moisture absorbing capacity, air circulation, and better moisture releasing capacity [14] and a lesser requirement as compared to those with a higher bulk density. Identifying the potential source of litter material is, therefore, necessary as it has a direct impact on the bird's welfare, health, and performance. Under local conditions, paddy husk and sawdust are the most commonly used bedding materials for poultry. However, due to the diversified use of the available litter materials, their availability and cost are becoming constraints. Therefore, it is necessary to explore alternative sources of bedding material to make poultry farming sustainable. Because the litter type can significantly affect the efficiency of a broiler and its production performance, the present study was conceived to assess the productive performance of broilers raised on different types of litter under the prevailing conditions with the following objectives:

1. To study the effect of different types of litter on the body weight and growth rate in broiler chicken.
2. To study the effect of different types of litter on the feed intake and feed conversion efficiency in broiler chicken.
3. To study the effect of different types of litter on mortality rate, performance index, dressing percentage and organ weight in boiler chicken.
4. To study the effect of some of the physical and chemical properties of the different types of litter material on the performance of broiler chicken.
5. To estimate the cost of production of broiler chicken raised on different types of litter material.

MATERIALS AND METHODS

A total of one hundred and twenty, day old, straight run, and commercial broiler strain Cobb-400 from a single hatch were procured for the study from M/S D.D. Poultry, Khatkhati, Assam. Hundred twenty (120) experimental chicks (day old) were randomly assigned to four different litter material in four pens of uniform size keeping 30 birds in each pen. After 21 days, each treatment was further divided into five replicates having six (6) numbers of birds in each replicate. The treatment groups were designated as T_1 (paddy husk), T_2 (saw dust), T_3 (wood shavings) and T_4 (paddy straw). The chicks were vaccinated against Marek's disease at the hatchery itself. Standard broiler starter and broiler finisher prepared as per BIS [15] were used for feeding the experimental birds which were procured from reputed commercial feed manufacturer M/S D.D. Poultry, Khatkhati, Assam. Four different types of litter material use viz; paddy husk, saw dust, paddy straw and wood shavings were used for the present study. Saw dust and paddy husk were procured from sawmill and rice mill, respectively while wood shavings and paddy straw were obtained from carpenters' shop and local farmers, respectively. The litter materials were properly dried before use. The chicks were made to drink individually by assisting them after which it was released into the brooding area. Starter mash in small quantities was later spread on the newspaper within the brooding area. The birds received feed and water *ad libitum* during the experimental period. Proper feeding and watering space was maintained. Starter ration was fed from 0-3 weeks and thereafter replaced by finisher ration. The feeders were filled up to ¾th level so as to avoid feed wastage. The left-over feed was measured the next day in the morning to assess the daily feed consumption of the bird. The chicks were vaccinated against Ranikhet disease with Lasota/ F_1 strain vaccine and Infectious Bursal Disease vaccine during first week and second week, respectively.

At the end of the experiment, two birds from each group were randomly selected for carcass evaluation. Live weight of the individual bird was recorded before slaughter. Slaughtering was done by using Kosher Method [16]. The dressed weight of the bird was obtained after complete bleeding and removal of feathers. Heart, liver, spleen and gizzard (empty) were also weighted individually and the average weight of each of these organs was recorded for the four respective groups. The percentage of dressed weight was calculated by using the following formula:

$$\text{Dressing (\%)} = \frac{\text{Dressed weight (g)}}{\text{Live weight}} \text{ x } 100$$

Three samples of litter material were collected from each treatment on 1, 21 and 42 days of experiment and subsequently analyzed to estimate bulk density, moisture percent and pH of the different litter materials as follows:

Bulk density is defined as the mass of the material divided by the total volume they occupy. Large amount of each material was placed into a measured plastic container and then was shaken until the container was full and packed firmly. Container plus material were weighed and bulk density was calculated as per standard formula and was expressed in g/cm^3.

$$\text{Bulk Density} = \frac{\text{Mass of built up litter}}{\text{Volume}}$$

Where,

Mass of built-up litter = Weight of the built-up litter material - Container

Volume = Length x Breadth x Height

Litter moisture was measured after drying the sample for 24h at 105°C [17]. Sample weighing 50g was measured before and after drying and calculated as follows:

$$\text{Moisture (\%)} = \frac{[(\text{Weight undried sample} + \text{Container}) - (\text{weight dried sampl} + \text{Container})]}{[(\text{Weight undried sample} + \text{containe}) - (\text{Weight empty container})} \times 100$$

For pH measurement, 10 g of macerated litter was added to 100ml distilled water in the ratio of (1:10), agitated for 15

minutes and suspended for 30 minutes. Thereafter, pH values of each sample were recorded by pH meter until constant values were obtained.

The economics of using different types of litter material was calculated on the basis of overall cost of inputs, i.e., the cost of chicks, feed, labour, medicines and other miscellaneous cost. The live weight of the bird at the end of experiment was considered for calculating the gross return per bird and net profit per bird. The result of experiment was subjected to statistical analysis in order to draw a valid interpretation and to see the effects of different treatments on various parameters using ANOVA in a completely randomized design as described by Gomez and Gomez [16].

RESULTS AND DISCUSSION

Body weight

The observation on variation in body weight in different treatment groups from day old to 6th week of age are presented in (Table 1). The average body weight of day-old chicks for different treatment groups i.e., T_1, T_2, T_3 and T_4 was recorded as 38.80, 39.17, 38.50 and 37.17 g per bird, respectively. The corresponding body weight in different groups recorded at the end of 6th week was 2504.00, 2714.00, 2726.23 and 2668.45 g per bird, respectively.

Statistical analysis had revealed significant effect of different types of litter on the final body weight. The final body weight of birds reared on wood shaving (T_3), saw dust (T_2), and chopped paddy straw (T_4) was significantly ($P<0.05$) higher as compared to paddy husk (T_1). These findings were in close agreement with the findings of Toghyani *et al.* [18], Chakma *et al.* [19], Shao *et al.* [20] and Sharma *et al.* [1] who observed significant effect of different types of litter materials on the body weight and have reported that birds reared on wood shavings showed significantly higher body weight. This might be as a result of favourable properties of wood shavings as reported by Grimes *et al*. [8], Su *et al*. [21] Farhadi [9]. Monira *et al.* [22], Atencio *et al.* [23] and Navneet *et al.* [24] observed non-significant difference in body weight when broilers were raised on different types of litter materials. Variation in results might be due to species/strain differences, types of litter used, agro-climatic differences, etc.

Table 1 Average body weight (g/bird/week) of broiler birds under different types of litter

Treatment	Weeks							Mean
	0	1	2	3	4	5	6	
T_1	38.80	174.40	441.50	899.00	1510.77	2003.70	2504.00^{a}	417.33
T_2	39.17	171.67	432.47	875.00	1433.63	1978.13	2714.00^{bc}	452.33
T_3	38.50	172.23	416.07	883.00	1457.95	2003.43	2726.23^{c}	454.37
T_4	37.17	176.77	441.47	908.00	1507.26	2031.97	2668.45^{ab}	444.74
SEm±					48.59	87.27	52.83	
CD 5%							184.74	

a,b,c Means bearing different superscript within column differ significantly ($P<0.05$)

Gains in body weight

The average weekly gain in body weight and mean gain in weight in different treatment groups are given in (Table 2). The average weekly gain ranged from 135.60 to 611.77; 132.50 to 735.87; 133.73 to 722.80 and 139.60 to 636.48 g /bird for T_1, T_2, T_3 and T_4, respectively while the overall mean gain in weight at 42 days of age for T_1, T_2, T_3 and T_4 groups was 410.87, 445.81, 447.96 and 438.50 g/ bird, respectively.

Table 2 Average gain in body weight (g/bird/week) of broilers under different types of litter material

Treatment	Weeks						Total	Mean
	1	2	3	4	5	6		
T_1	135.60	267.10	457.50	611.77	492.93	500.30	2465.20	410.87
T_2	132.50	260.80	442.53	558.63	544.50	735.87	2674.83	445.81
T_3	133.73	243.84	466.93	574.95	545.48	722.80	2687.73	447.96
T_4	139.60	264.70	466.53	599.00	524.71	636.48	2631.02	438.50
SEm±				34.93	15.87	55.06		

Statistically no significant difference in weight gain was observed among the treatment groups irrespective of the different litter materials. Similar findings were reported by Atapattu and Wickramasinghe [25], Atencio *et al.* [23] and Navneet *et al.* [24] who did not find any significant difference in body weight gain in broilers due to different types of litter. However, Adebayo *et al*. [26] and Chakma *et al.* [19] reported significant body weight gain in broiler birds under different types of litter. The variation in the result might be attributed to species/strain differences, types of litter used, agro-climatic differences, seasons, etc.

Feed intake

The average weekly feed intake and total feed intake of different experimental groups up to six weeks of age during the experimental period are presented in (Table 3). The total feed intake during the entire trial period for T_1, T_2, T_3 and T_4 groups was 5594.16, 5651.92, 5628.34 and 5577.98 g per bird, respectively. At 4th week, the feed intake was 1007.47, 1018.64, 1039.76 and 1013.09 g per bird for T_1, T_2, T_3 and T_4, respectively. The corresponding values at 5th week were 1576.75, 1631.26, 1615.91 and 1589.40 g per bird, respectively. At 6th week the values for the respective groups were 1831.32, 1843.32, 1799.40 and 1799.35 g per bird.

Statistical analysis had revealed that the feed intake was unaffected by different types of litter [22], [27]. The results of the present findings were contrary to Biswas *et al.* [28] (2001), Mendes *et al.* [27] and Onu *et al.* [29] who had reported significant effects of different types of litter on feed intake of broiler birds.

Feed conversion efficiency

The average weekly feed conversion efficiency and mean feed efficiency of the different experimental groups up to six weeks of age are depicted in (Table 4). The overall mean feed conversion efficiency of broiler birds in different groups was 2.06, 1.87, 1.87 and 1.90 for T_1, T_2, T_3 and T_4, respectively. The feed conversion efficiency at 4th week was 1.64, 1.82, 1.80

and 1.69 for T_1, T_2, T_3 and T_4, respectively. The corresponding values at 5th week were 3.20, 2.99, 2.96 and 3.03, respectively. At 6th week, the values for the respective groups were 3.66, 2.50, 2.49 and 2.83.

Table 3 Average feed intake (g/bird/week) of broiler birds in different treatment groups

Treatment	Weeks						Total	Mean
	1	2	3	4	5	6		
T_1	137.27	381.78	659.57	1007.47	1576.75	1831.32	5594.16	932.36
T_2	136.04	363.10	659.56	1018.64	1631.26	1843.32	5651.92	941.99
T_3	135.70	377.60	659.97	1039.76	1615.91	1799.40	5628.34	938.06
T_4	137.77	378.40	659.97	1013.09	1589.40	1799.35	5577.98	929.66
SEm±				2.04	4.24	3.76		

Table 4 Average feed conversion efficiency of broiler birds in different treatment groups

Treatment	Weeks						Total	Mean
	1	2	3	4	5	6		
T_1	1.01	1.43	1.44	1.64^{a}	3.20^{b}	3.66^{c}	12.38	2.06
T_2	1.03	1.39	1.49	1.82^{b}	2.99^{a}	2.50^{a}	11.22	1.87
T_3	1.01	1.55	1.41	1.80^{b}	2.96^{a}	2.49^{a}	11.22	1.87
T_4	0.99	1.43	1.41	1.69^{a}	3.03^{a}	2.83^{b}	11.38	1.90
SEm±				0.02	0.04	0.04		
CD 5%				0.06	0.14	0.13		

a,b,c Means bearing different superscript within column differ significantly (P<0.05)

The statistical analysis had revealed significant effect of litter types (P<0.05) on feed efficiency. At 4th week, better FCE was observed in T_1 and T_4 as compared to T_2 and T_3. At 5th week, T_2, T_3 and T_4 group showed better FCE than T_1 group. Meanwhile at 6th week, best FCE was observed in group T_2 and T_3 group followed by T_4 and poorer FCE was observed in T_1 group. Hence, it indicated that birds reared on saw dust and wood shavings had utilized the feed efficiently.

These results were in close agreement with Onu *et al.* [29], Chakma *et al.* [19] and Sharma *et al.* [1] who observed significant effect of litter types on feed conversion efficiency. They observed better FCE for birds reared on litter materials such as wheat straw, rice husk, saw dust, paddy straw and pine leaves. However, these findings were contrary to the findings of Karousa *et al*. [30] and Naveet *et al*. [31] who reported non-significant effect of different types of litter material on feed conversion efficiency. Such contradictory results might be due to difference in strains of bird, type of litter material, variation in agro-climatic condition and other environmental factors.

Dressing percentage, carcass yield and organ weight

The average dressing percentage, carcass yield and organ weight in different treatment groups are presented in (Table 5). The average dressing percentage of broiler birds at the end of sixth week in different groups T_1, T_2, T_3 and T_4 were 76.61, 77.34, 77.39 and 77.10 percent, respectively.

Table 5 Dressing percentage, carcass yield and organs weight (g/bird) of broiler birds in different treatment groups

Group	Dressing %	Carcass weight (g)	Organ weight (g)			
			Gizzard	Heart	Liver	Spleen
T_1	76.61	2299	43.31	15.92	68.53	4.73
T_2	77.34	2287	46.70	15.45	54.33	2.91
T_3	77.39	2314	40.41	14.71	59.11	2.84
T_4	77.10	1922	35.24	11.58	50.16	2.06
SEm±		5.59	2.54			

Table 6a Interaction effect of litter and days on pH, moisture percent and bulk density

Interaction between litter and days	pH			Moisture %			Bulk density (g/cm^3)		
	Initial	21 days	42 days	Initial	21 days	42 days	Initial	21 days	42 days
T_1	5.15^{ab}	5.67^{b}	6.66^{d}	11.84^{a}	15.99^{e}	30.60^{h}	0.27^{c}	0.36^{d}	0.35^{d}
T_2	5.20^{b}	5.62^{b}	6.70^{d}	11.99^{a}	13.65^{c}	56.47^{j}	0.17^{b}	0.47^{e}	0.13^{b}
T_3	4.54^{a}	7.00^{d}	6.78^{d}	12.72^{b}	15.26^{d}	34.87^{i}	0.07^{a}	0.28^{c}	0.42^{e}
T_4	6.82^{d}	6.57^{c}	6.89^{d}	12.98^{b}	17.47^{f}	25.01^{g}	0.06^{a}	0.99^{f}	0.43^{e}
SEm±		0.19			0.08			0.01	
CD 5%		0.65			0.28			0.05	

a,b,c,d,e,f,g,h,i Means bearing different superscript within column differ significantly (P<0.05)

The average carcass weight of broiler birds in different experimental groups was 2299, 2287, 2314 and 1922 g/bird for T_1, T_2, T_3 and T_4 groups, respectively. The average gizzard weight was 43.31, 46.70, 40.41 and 35.24 g for T_1, T_2, T_3 and T_4 groups, respectively. The average heart weight for T_1, T_2, T_3 and T_4 groups was 15.92, 15.45, 14.71 and 11.58 g, respectively. The average liver weight was 68.53, 54.33, 59.11 and 50.16 g for T_1, T_2, T_3 and T_4, respectively. The average spleen weight for T_1, T_2, T_3 and T_4 groups was 4.73, 2.91, 2.84 and 2.06 g, respectively. Numerically, birds reared on wood shaving (T_3) showed higher values for dressing percentage and carcass weight while higher values for the organ weight was observed in those birds which were reared on paddy husk (T_1).

Physical and chemical properties of litter material

The values for interaction effect of litter and days of observation on pH, moisture percent and bulk density is presented in (Table 6a). The average values of pH, moisture

percent and bulk density of litter material as influenced by types of litter material and days of observation is presented in (Table 6b-c), respectively.

From the data given in (Table 6a), the values for pH, moisture percent and bulk density (g/cm^3) due to the interaction effect of litter material and days of observation varied from 5.15 to 7.00; 11.84 to 56.47 and 0.06 to 0.99, respectively. The perusal of the table revealed that the values of pH, moisture and bulk density differed significantly ($p<0.05$) as a result of interaction between litter material and days of observation.

Table 6b Average pH, moisture percent and bulk density as influenced by types of litter

Litter	pH	Moisture (%)	Bulk density (g/cm^3)
T_1	5.83^a	19.48^b	0.33^b
T_2	5.84^a	27.37^d	0.26^a
T_3	6.11^a	20.95^c	0.26^a
T_4	6.76^b	18.48^a	0.46^c
SEm±	0.07	0.02	0.004
CD 5%	0.31	0.10	0.02

a,b,c,d Means bearing different superscript within column differ significantly (P<0.05)

The pH values of litter material T_1, T_2, T_3 and T_4 was 5.83, 5.84, 6.11 and 6.76, respectively. The moisture percent of the corresponding litter material was 19.48, 27.37, 20.95 and 18.48, respectively. The bulk density (g/cm^3) for the respective litter materials was 0.33, 0.26, 0.26 and 0.46. The pH values of T_1, T_2, and T_3 groups were significantly ($P<0.05$) low as compared to T_4 (paddy straw) group which indicates that level of acidity in paddy husk, saw dust and wood shavings was higher as compared to chopped paddy straw. These findings corroborated with the observations of Coufal *et al*. [32], Farhadi [9] and Koli *et al*. [2] who also reported significant effect of litter types on pH and the values obtained were comparable with the values reported by these researchers.

Moisture percent in the litter materials significantly ($P<0.05$) varied among the treatments and higher moisture was observed in saw dust followed by wood shaving, paddy husk and the least in chopped paddy. Higher moisture percent in saw dust might be due to the smaller particle size of the litter which normally increases the tendency to absorb and retain the moisture and thereby affect the moisture releasing capacity of litter. The results of the present study was similar to the findings of Karousa *et al*. [30] and Sigroha *et al*. [31] who had also reported significant differences in the litter moisture percent [33-34].

The values of pH on 1, 21 and 42 days (D_1, D_2 and D_3) were 5.43, 6.22 and 6.76, respectively while the values for moisture percent for the corresponding day was 12.38, 15.59 and 36.74, respectively. The values for bulk density (g/cm^3) were 0.140, 0.53 and 0.31 for D_1, D_2 and D_3, respectively. Statistical analysis had revealed significant ($P<0.05$) effect of days of observation on pH, moisture percent and bulk density. The values for pH and moisture percent showed an increasing trend with increase in days of observation however, the increase in bulk density was not consistent.

Table 6c Overtime variation in pH, moisture percent and bulk density of litter material (0-42 days)

Days of observation	pH	Moisture	Bulk density
D_1	5.43^a	12.38^a	0.14^a
D_2	6.22^b	15.59^b	0.53^c
D_3	6.76^c	36.74^c	0.31^b
SEm±	0.09	0.04	0.01
CD 5%	0.32	0.14	0.04

a,b,c,d Means bearing different superscript within column differ significantly (P<0.05)

Cost of production

The average cost of production for T_1, T_2, T_3 and T_4 was 270.49, 272.35, 271.60 and 269.99 rupees per bird, respectively. The corresponding values for average cost of production per kg live weight of bird was 108.02, 100.35, 99.63 and 101.20 rupees, respectively. The net profit per bird was 56.36, 81.80, 84.11 and 78.18 rupees, respectively for T_1, T_2, T_3 and T_4 groups, respectively and the corresponding values for net profit per kg live weight of bird was 22.51, 30.14, 30.85 and 29.30 rupees, respectively. The benefit cost ratio for the respective groups was 1.21, 1.30, 1.31 and 1.29.

CONCLUSION

Different types of litter had significant ($P<0.05$) effect on the final body weight and feed conversion efficiency. The final body weight of birds reared on saw dust (T_2), wood shaving (T_3) and chopped paddy straw (T_4) was significantly ($P<0.05$) higher as compared to paddy husk (T_1). Best FCE was observed in groups reared on saw dust and wood shavings. Body weight gain and feed intake was unaffected by different types of litter material. Highest live ability (100 percent) and best performance index was observed in birds reared on wood shavings. Litter types had significant effect on pH, moisture percent and bulk density of litter materials. Paddy husk saw dust and wood shavings had lower pH values as compared to chopped paddy straw. Chopped paddy straw had the lowest moisture percent as compared to other litter materials. Saw dust and wood shaving had lower bulk density and the highest was in chopped paddy straw. The overtime interaction of litter material and days of observation had significant effect on pH, moisture percent and bulk density of litter material. The values for pH, moisture percent and bulk density of litter material followed an increasing trend with increase in days of observation except for the bulk density. The average cost of production per bird was comparable in all the groups. Higher cost of production per kg live weight of broiler was observed in T_1 and the least was in T_3 groups. Highest net profit per bird, net profit per kg live weight of broiler and the benefit cost ratio was observed in T_3 and the least in T_1. Hence, it was observed that birds reared on wood shavings performed better in terms of body weight, feed efficiency, dressing percentage, carcass yield, live ability, and performance index, lowest cost of production per kg live weight and highest net profit and benefit cost ratio. On the contrary, birds reared on paddy husk showed lower values for these parameters. Based on the above findings,

it may be concluded that wood shavings can serve as a potential alternative litter material to maximize production and profit in broiler production.

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Conflict of interest

The authors of this manuscript declare that there is no conflict of interest.

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