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Effect of different litter materials on growth performance of broiler chickens

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Abstract

Two hundred forty day old Vencobb 400 straight run commercial broiler chicks were randomly divided into three groups with two replicates of 40 chicks in each to assess the effect of different litter materials on growth performance of broiler chickens. The broiler chicks were kept on rice husk, 50 % rice husk + 50 % paddy straw and wood saving in T_c, T_{MIX} and T_{WS} groups, respectively for a period of 42 days. The results of the experiment showed that broiler chicks kept under T_{MIX} (3027.20^b±80.50g) i.e. combinations of paddy straw with rice hulls were heavier as compared to the other litter treatments. The overall body weight gain was numerically higher in T_{MIX} as compared to the other litter treatments. It was also evident that feed intake was higher in T_c groups as compared to T_{MIX} and T_{WS} groups. The overall FCR was superior in T_{MIX} group (1.84^a±0.21) as compare to other group T_{WS} (2.22^{ab}±0.15) and T_c (2.42±0.11). The results of the present experiment concluded that the growth performance indicated that final body weight, body weight gain, FCR were better in T_{MIX} group than wood saving and the control group broiler birds however, feed intake was higher in T_c group.

Keywords: litter materials, paddy straw, rice hulls, broiler chicken

Introduction

The Poultry industry has emerged as the fastest growing segment of the livestock sector both globally as well as in India (Lisa Augustine and Ruchira Shukla, 2015) [7]. Now a days poultry meat is available for huge groups of consumers due to revolutionary mechanization of the poultry sector in recent years. The higher nutritional, sensory and economical characteristics of poultry meat have made it, far most famous animal food product globally. It has a high potential to generate foreign exchange earnings through export of poultry products to neighboring countries (Lisa Augustine and Ruchira Shukla, 2015) [7]. Broiler production is one of the most dynamic and fastest growing animal husbandry sub-sectors in India. The total poultry population has increased by 16.81% over in the recent census and the total poultry in the country is 851.81 million. However, in previous census 2012 it was 729.21 million in numbers (Livestock census, 2019) [12]. Due to increasing population growth, rising income and urbanization there is an increasing demand of animal protein source so that chicken meat has shown its fastest growth in last two decades.

The type of bedding can affect performance of broiler birds (Billgilli *et al.*, 1999b) [2]. The litter type affects litter bacteria and litter consumption which may influence the immunity and performance of broilers (Lien *et al.*, 1992) [10]. Common bedding materials include rice husk, paddy straw, wood shavings, sawdust, peanut hulls, shredded sugar cane, straw, and other dry, absorbent, low-cost organic materials. Sand is also occasionally used as bedding. The efficiency of litter type can be influence by various factors such as physical properties of the material used, particle size, build up moisture content and rate of caking. In many areas sawdust and wood shavings are most commonly used bedding materials for commercial poultry production. The higher cost, poor supplies and unavailability of these litter materials has encouraged the search for suitable substitute litter materials. Good bedding materials should absorb the moisture from body wastes, limiting the production of harmful pathogenic micro-organisms and ammonia, provide a dry, comfortable medium to broilers for dusting themselves in and rest upon. Therefore, it should be soft, compressible, absorbent and capable of drying quickly.

In this context the use of crop and wood residues as poultry litter seems to be promising. Hence, the present experiment was designed to assess the effect of different litter materials on

the growth performance of broiler chickens.

Materials and Methods

The present study was aimed to assess the effect of different litter materials on the growth performance of broiler chickens at the poultry unit of livestock farm complex of the college of veterinary sciences and animal husbandry, A.N.D.U.A.T. Kumarganj, Ayodhya, U.P. Two hundred forty day old Vencobb 400 straight run commercial broiler chicks were randomly divided into three groups with two replicates of 40 chicks in each to assess the effect of different litter materials on growth performance of broiler chickens. The broiler chicks were kept on rice husk, 50 % rice husk + 50 % paddy straw and wood saving in Tc, T_{MIX} and T_{WS} groups, respectively for a period of 42 days. The live body weights and feed intake of all the broiler chicks were recorded replicate wise at weekly interval. The average feed intake was calculated from the total feed offered minus feed residue left on the first day morning of next week. These data were used to calculate the average weekly body weight, weight gain per bird and feed conversion ratio (FCR) for all the groups.

Statistical analysis

To assess the impact of different litter materials on growth performance of broiler chickens, experimental data were subjected to analysis of variance (ANOVA), using IBM SPSS Statistics® (20) software [6]. The means were compared for statistical significance difference at 5% level by Duncan alpha comparison.

Results and Discussion

The results of the experimental study to assess the effect of different litter materials on growth performance of broiler chickens have been shown as below:

(A) Weekly body weight

The data of average means for the body weight at different weeks of age are presented in Table 2 and depicted in Figure 1. The statistical analysis of data revealed that various treatments had highly significant ($P<0.05$) influence on live weight of birds. The significantly highest body weight was observed for treatment group Tmix (1090.80b±13.07) at 3rd week of age. Whereas, for Tc and Tws these value were not significant with each other. After six week, the body weight of Tc group (2720.00a±38.60) was significantly ($P<0.05$) differ as compare to Tmix (3027.20b±80.50) and Tws (2926.60b±64.23) groups. However, Tmix attained higher numerical value that is 3027.20b±80.50. Over all finding showed that average weekly body weight of birds increased with their age. On the basis of these results the present study indicated that the mixture of paddy straw + rice husk litter had a better affect on average weekly body weight. The results of present study were in contradiction to the findings of Lien *et al.* (1998) [10], Navneet *et al.* (2011) [11], Farghly (2012) [4] and Karousa *et al.* (2012) [9]. They revealed that different litter type had no significant effect on body weight. This might be due to strain of birds and quality of litters.

Table 2: Average weekly body weight of broiler chicks

Age in weeks	Average weekly body weight of broiler chicks (g)		
	TC	Tmix	TWS
0 day	44.60±.55	45±1.06	45.20±1.04
1 st	182.30±5.15	183.90±2.73	187.60±4.34
2 nd	489.70±12.61	475.50±8.99	494.50±9.30
3 rd	1065.30a±3.84	1090.80b±13.07	1063.90a±3.49
4 th	1739.00±33.74	1717.70±82.23	1729.80±44.72
5 th	2360.00±43.01	2520.00±111.83	2500.70±63.35
6 th	2720.00a±38.60	3027.20b±80.50	2926.60b±64.23
Over all	1228.7±19.64	1294.3±42.915	1278.32±27.21

Means with different superscripts differ significantly ($P<0.05$).

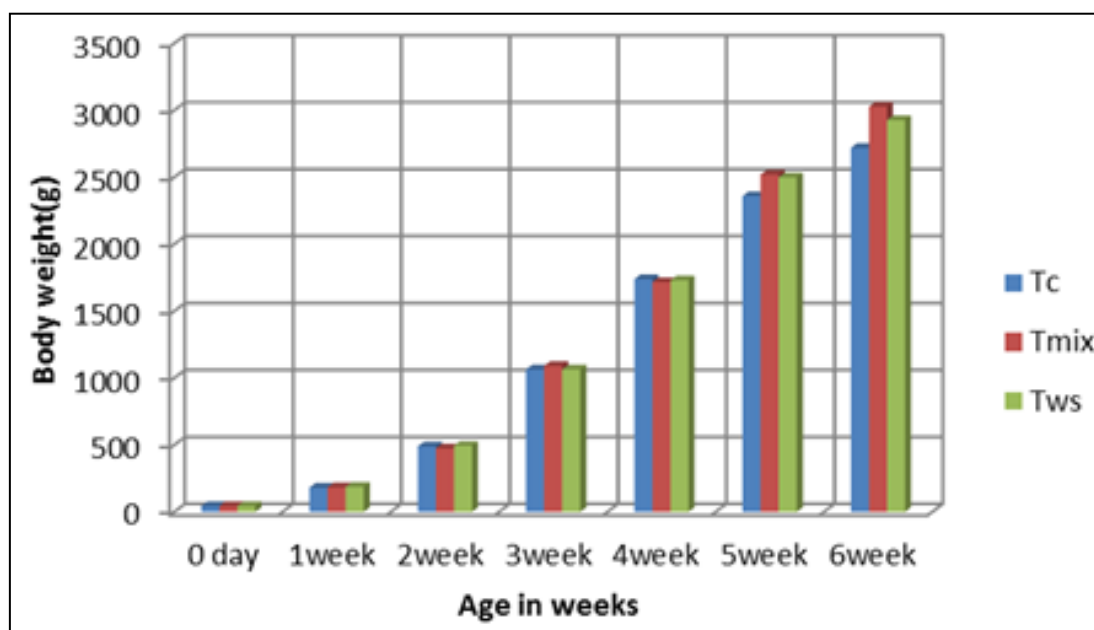


Fig. 1: Average weekly body weight (g) of broilers grown on different bedding materials

(B) Weekly body weight gain

The data for the average body weight gain (BWG) at different week intervals are depicted in Figure 2. The statistical analysis of data revealed that various treatments had highly significant ($P < 0.05$) influence on average BWG of birds. The significantly highest body weight gain was observed for treatment group Tmix (615.30^b±14.22) at 3rd week of age. Whereas Tmix and Tws these value are significant with each other and Tc (575.60^{ab}±12.91) are not significant. In this week lowest body weight was in Tws group (569.40^a±11.66). In Tc group average weekly weight gain increased from 1st week to 4th week and from 4th to last week it's value decreased.

Whereas, in Tmix and Tws both groups average weekly BWG increased from 1st week to 5th and decreased from 5th to 6th week. The results of present study revealed that the mixture of paddy straw + rice husk litter had a better affect on average weekly body weight gain. These results of present study were similar to the findings of Asaniyan *et al.* (2007)^[1], El-Deek *et al.* (2011)^[3] and Kalita *et al.* (2012)^[8]. However, these results were in contradiction to the findings reported by Lien *et al.* (1998)^[10], Hafeez *et al.* (2009)^[5], Navneet *et al.* (2011)^[11], Farghly (2012)^[4] and Karousa *et al.* (2012)^[9]. They reported that different litter material had no significant ($P > 0.05$) effect of on weekly BWG in broiler chicks.

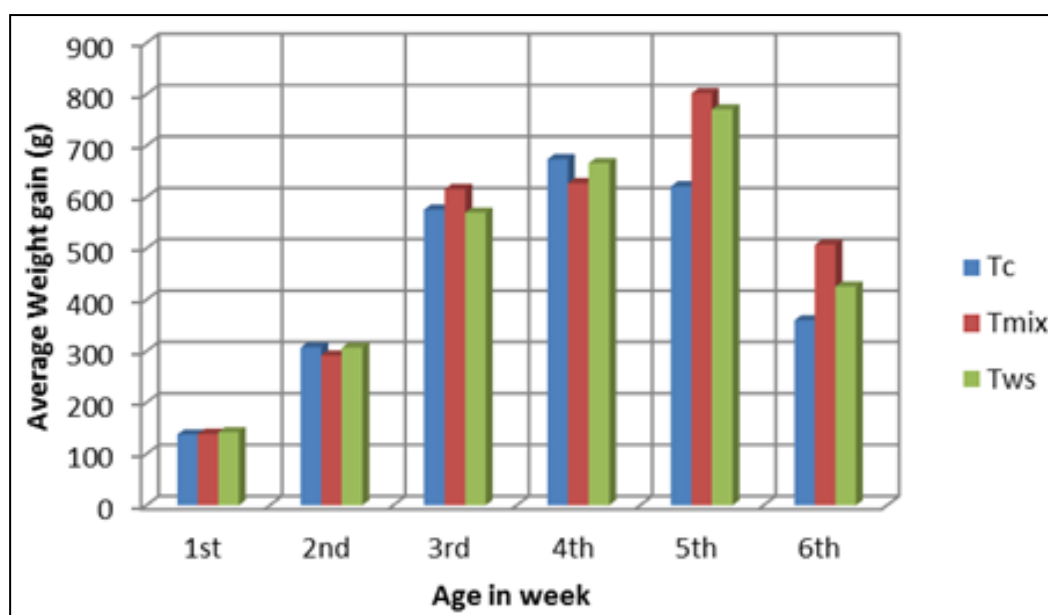


Fig. 2: Average weekly body weight gain (g) of broilers grown on different bedding materials

(C) Weekly feed intake

The results for average weekly feed intake of broilers are presented in Table 3 and depicted in Figure 3. The statistical analysis of data revealed that the differences among average weekly feed intake of the birds from different groups were statistically non-significant. However, highest feed intake was observed in Tc and Tws groups, whereas; lowest feed intake was observed in Tmix group birds. Similar findings were found by Asaniyan *et al.* (2007)^[1], they concluded that feed consumptions was non-significantly affected by litter material and depth of litter. Hafeez *et al.* (2009)^[5] found non-significant effect on feed consumption for saw dust, sand and

wheat straw as litter material. Navneet *et al.* (2011)^[11] and Karousa *et al.* (2012)^[9] reported non-significant effect on feed intake on broilers kept on different bedding materials and all these findings are in accordance with the non significant ($P > 0.05$) impact of litter material on feed intake. In contrary to these findings, El-Deek *et al.* (2011)^[3] reported that the feed intake was significantly highest in broilers grown on wood shaving in combination with barley straw and newspaper as bedding materials. They also reported that wood shavings in combination with barley straw and newspaper improved the feed intake.

Table 3: Average weekly feed intake of broiler chicks

Age in weeks	Average weekly feed intake of broiler chicks (g)		
	Tc	Tmix	Tws
1 st	152.5±0.04	150.4±0.03	151.6±0.5
2 nd	462.50±12.50	471.50±3.50	434.50±22.50
3 rd	896±9.0	874.50±61.50	864.0±11.0
4 th	877.50±17.50	861.50±7.50	905±45.0
5 th	1262±1.0	1261±21.50	1286±4.0
6 th	1050±50.0	890±90.0	925±75.0
Over all	783.41±15.00	751.48±30.67	761.0167±26.33

Means with different superscripts differ significantly ($P < 0.05$).

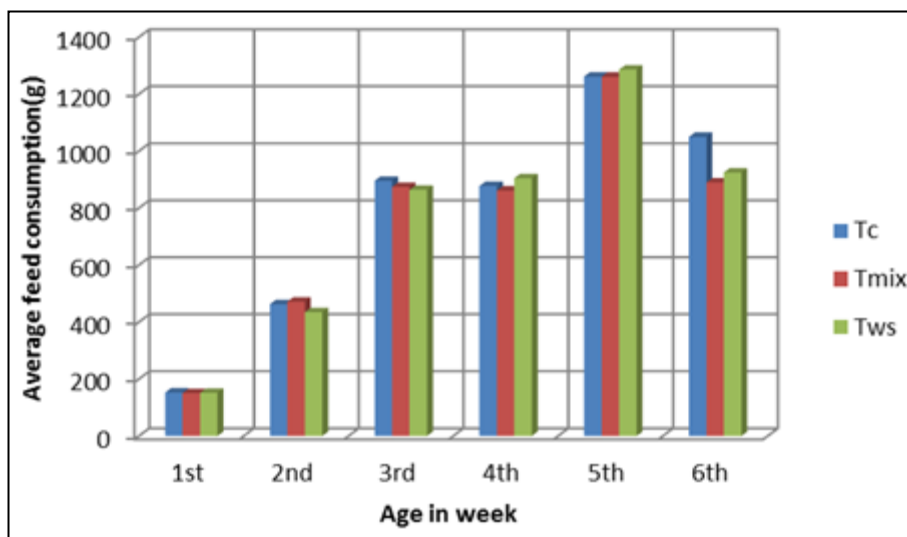


Fig. 3: Average weekly feed intake (g) of broilers grown on different bedding materials

(D) Weekly Feed Conversion Ratio (FCR)

The results for weekly FCR of broiler chicks grown on different litter materials in different age groups are presented in Table 4 and depicted in Figure 4. The means for weekly FCR between the treatment groups showed significant ($P < 0.05$) differences. The statistical analysis of variance for weekly FCR of broiler chicks grown on different combination of bedding materials revealed highly significant ($P < 0.05$) effect. At 2nd week of age the broilers of Tws group had superior FCR ($1.41^{a \pm .03}$) as compare to other groups i.e. Tc ($1.52^{ab \pm .07}$) and Tmix, ($1.62^{b \pm .04}$). Tmix and Tws were significant ($P < 0.05$) with each other whereas, Tc had no significant ($P > 0.05$) difference. At 3rd week of age feed conversion ratio of Tc and Tmix group broilers were

significant ($P < 0.05$) with each other and Tws had no significant ($P > 0.05$). However, Tmix, ($1.42^{a \pm .03}$) had superior FCR than both Tws ($1.52^{ab \pm .03}$) and Tc ($1.55^{b \pm .03}$). At the end of 6th week Tmix ($1.84^{a \pm .21}$) had superior FCR than both Tws ($2.42^{b \pm .11}$) and Tc ($2.22^{ab \pm .15}$) groups, respectively. Among the treatment groups, Tc and Tmix both are significant ($P < 0.05$) with each other and Tws had no significant ($P > 0.05$). Over all finding indicated that average weekly FCR of broiler chicks had better results at 5th week of age rather than 6th week of age.

The results of present study for FCR indicated that the mixture of paddy straw + rice husk litter had a better affect on average weekly FCR than other treatment groups. The findings

Table 4: Average weekly feed conversion ratio (FCR) of broiler chicks

Age in weeks	Average weekly feed conversion ratio (FCR) of broiler chicks		
	Tc	Tmix	Tws
1 st	1.09±.04	1.08±.02	1.05±.02
2 nd	1.52 ^{ab} ±.07	1.62 ^b ±.04	1.41 ^a ±.03
3 rd	1.55 ^b ±.03	1.42 ^a ±.03	1.52 ^{ab} ±.03
4 th	1.31±.06	1.52±.28	1.38±.10
5 th	2.07±.13	1.77±.37	1.74±.19
6 th	2.42 ^b ±.11	1.84 ^a ±.21	2.22 ^{ab} ±.15
Over all	1.66±0.07	1.54±0.15	1.55±0.08

Means with different superscripts differ significantly ($P < 0.05$).

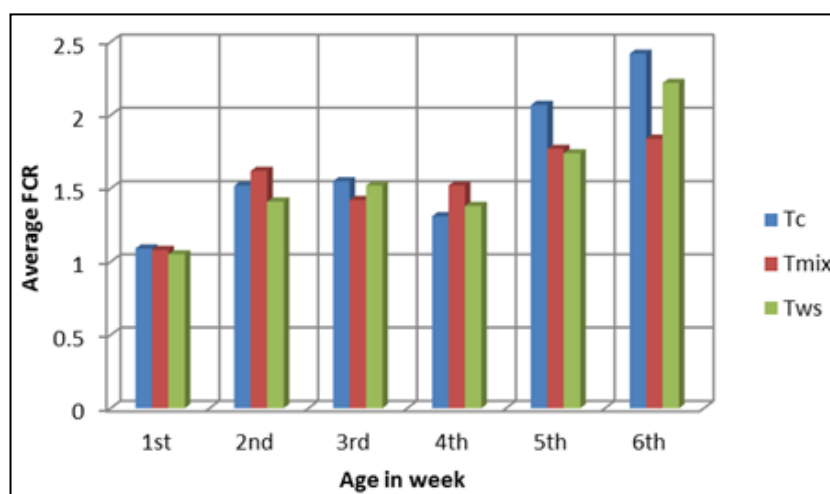


Fig. 4: Average weekly feed conversion ratio (FCR) of broilers grown on different bedding materials

are in accordance with the results of Asaniyan *et al.* (2007)^[1], El-Deek *et al.* (2011)^[3] who reported improved broiler FCR with different litter materials. In contrary to the these findings, Hafeez *et al.* (2009)^[5] found that feed conversion ratio for sawdust, sand and wheat straw as a bedding material was non-significant ($P>0.05$). Similarly, Navneet *et al.* (2011)^[11], Karousa *et al.* (2012)^[9], Farghly (2012)^[4] and Kalita *et al.* (2012)^[8] found that there was no significant ($P>0.05$) differences among the broilers raised on different types of litter on the feed conversion ratio.

Conclusion

The present investigation entitled “Effect of different litter materials on growth performance of broiler chickens” was evident that the broiler chicks were heavier under T_{mix} i.e. combinations of paddy straw with rice hulls as compared to the other litter treatments. It was found that overall gain in body weight was numerically higher in T_{mix} as compared to the other litter treatments. From the study it was evident that feed intake was higher in T_c groups as compared to T_{mix} and T_{ws} groups. The overall FCR was superior in T_{mix} (i.e. $1.84^a \pm 0.21$) group as compare to other group T_{ws} ($2.22^{ab} \pm 0.15$) and T_c (2.42 ± 0.11). The data on growth performance indicated that final body weight, body weight gain, FCR were better in T_{mix} i.e. combinations of paddy straw with rice hulls treatment groups than wood saving groups and the control group. But feed intake was higher in T_c groups.

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