Efficacy of pine leaves as an alternative bedding material for broiler chicks during summer season

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Abstract

Aim: The aim was to assess the efficacy of pine leaves as an alternative bedding material on the performance of broiler chicks.

Materials and Methods: The present study was conducted in summer. Total 120, day old Vencobb straight run chicks were procured, and after 5 days of brooding, chicks were randomly distributed into four treatment groups viz. paddy husk (Group I), paddy straw (Group II), pine leaves (Group III), and combination of paddy straw and pine leaves (Group IV), each having 30 chicks with 3 replicates of 10 chicks each. Chicks were reared under intensive conditions in houses that have a semi-controlled environment, with optimum temperature and adequate ventilation. Food and water were provided as per NRC (1994) requirement.

Results: The average body weight after 6 weeks of the experiment was 2018.83±31.11, 1983.80±33.27, 2007.36±35.73, and 1938.43±36.35 g. The bedding type had no significant effect on the carcass characteristics viz. evisceration rate and proportion of cut-up parts of the carcass except giblet yield. The experiment suggested that performance of broiler chicks reared on paddy straw and pine leaves as litter material, had improved body weight and feed conversion ratio as compared to rearing on paddy husk as bedding material. Bacterial count, parasitic load and the N, P, K value of manure of different bedding material shows no significant difference.

Conclusion: Pine leaves have a potential to be used as an alternative source of litter material to economize poultry production in a sustainable way, so as to make poultry farming as a profitable entrepreneur.

Keywords: litter material, paddy husk, paddy straw, pine leaves.
to diversified use of these materials, their availability is decreasing, and cost is increasing day by day. With the banning of cage system by EU and launching of National Program for Organic Production [24] in India, requirement of bedding material is expected to increase many folds in near future and make the poultry industry less profitable entrepreneur. Therefore, it is necessary to seek alternative sources of bedding material to make the poultry industry as a sustainable entrepreneur. State like J & K is blessed with pine forests (1825 km²) as per Directorate of Economics and Statistics [25] which could be exploit in poultry production by utilizing its wood shaving [26] or pine leaves as litter material in a sustainable way.

The pine leaves are utilizing as a bedding material in pet animals in many countries because of its anti-microbial property and could be a good litter material for raising of poultry. Keeping this in view an experiment was conducted to compare the efficacy of paddy husk, paddy straw, and pine leaves as a litter material for raising of broilers.

**Materials and Methods**

**Ethical approval**

Permission of the Institutional Animal Ethics Committee was taken prior to the start of the experimental study.

**Location and preparation of poultry shed**

The experiment was carried out at the Poultry shed having semi-controlled environment, with optimum temperature and adequate ventilation, SKUAST-J, R. S. Pura, Jammu is located at 32°38’N 74°44’E/32.63°N 74.73°E at an average elevation of 270 m (886 ft) during the summer season (10th May-21st June, 2013). The pens were cleaned and disinfected with phenyl solution before spreading litter and placing birds at random.

**Collection and processing of bedding material**

The bedding materials used were collected from a local area of Jammu region in the month of December-March 2013. After proper drying under the sun, they were processed for the preparation of bedding material. The bedding materials were provided with a depth of 5 cm during the rearing period.

**Experimental design**

The experiment was conducted in completely randomized design, a total of 120, day-old commercial (Vencobb) broiler chicks were procured and after 5 days of brooding were randomly divided into four groups having total 30 chicks in each group with their 3 replicates, each having 10 chicks and kept in a deep litter system. The litter material used was paddy husk (Group I), paddy straw (Group II), pine leaves (Group III), and (Group IV) with combination of paddy straw and pine leaves (50:50). The ration fed to the broiler birds were procured from commercial out let having nutritive value mentioned in Table-1 and other managerial conditions were similar throughout the study period.

| Proximate principles | Broiler starter | Broiler grower | Broiler finisher |
|----------------------|----------------|---------------|-----------------|
| CP (%)               | 22.03          | 20.24         | 18.06           |
| ME (kcal/kg feed)    | 2858           | 2895          | 2960            |
| C:P Ratio            | 129.73         | 143.03        | 163.89          |

CP=Crude protein, ME=Metabolizable energy, C:P=Calorie:Protein

**Meteorological parameters**

The overall mean maximum temperature recorded inside the poultry shed ranged from 33.75°C to 43.42°C (overall mean - 38.39°C) and outside the poultry shed ranged from 34.18°C to 43.05°C (overall mean - 38.40°C), and the overall mean minimum temperature recorded in the poultry shed ranged from 22.81°C to 29.86°C (overall mean - 26.13°C) and outside the poultry shed ranged from 22.57°C to 29.48°C (overall mean - 25.50°C). The percent relative humidity ranged from 28.61% to 68.42% in the morning (overall mean - 46.58%), 47.15-52.21% in the afternoon (overall mean - 49.47%) and 52.24-67.14% in the evening (overall mean - 60.52%). The high and low percent relative humidity outside the shed was ranged from 27.57% to 63.71% (overall mean - 44.26%) and 12.14-50.14% (overall mean - 31.71%), respectively. The mean temperature humidity index (THI) varied from 71.10 to 76.21 (overall mean - 74.02) during morning (0900 h), 87.44-88.87 (overall mean - 88.01) during afternoon (1300 h), and 75.34-81.20 (overall mean - 77.99) during evening (1800 h).

**Statistical analysis**

The results obtained were subjected to analysis of variance and treatment means were ranked using Duncan’s multiple range test. Significance was declared at p<0.05 unless otherwise stated.

**Results**

The performance of broilers on different bedding types are summarized in Table-2. At the age of 42 days, body weight of broilers was not significantly (p<0.05) affected by the litter type. Broilers grown in Group I had the highest body weight and Group IV had the lowest body weight (Table-3). Accordingly, body weight gain per day was highest in Group I and lowest in Group IV. Total feed intake in different
groups of broilers did not differ significantly. Broilers reared on Group I have highest dry matter feed intake whereas those reared on Group IV have lowest dry matter feed intake (Table-4). Feed conversion ratio (FCR) of Group I and Group III did not differ significantly and were lower when compared to other two groups. Percentage of eviscerated weight, breast, and thigh were not affected by litter type (p<0.05), but significant differences were observed for giblet yield (Table-5). Percentage of eviscerated weight and breast were highest in Group I and lowest in Group IV and percentage of the thigh was highest in Group II and lowest in Group III. Percentage of giblet yield was significantly different and tended to be highest in Group I and lowest in Group II.

The bacterial load (Staphylococcus and Escherichia coli counts) and parasitic load were slightly higher in Group IV and lower in Group III showing a non-significant difference (Table-6). The data recorded for N, P, and K content of the manure in the experiment (Table-7) indicated that there was no significant difference in N, P, and K content of

| Table-2: Overall mean±SE of growth performance of chicks. |
|----------------------------------------------------------|
| Parameters | Treatment |
|------------|-----------|
| Average body weight (g) | Group I | 2018.83±31.11 | Group II | 1983.80±33.27 | Group III | 2007.36±35.73 | Group IV | 1938.43±36.35 |
| Body weight gain (g) | 1930.47±7.83 | 1895.33±5.34 | 1917.43±9.43 | 1848.93±4.38 |
| Feed intake (g) | 3623.47±28.15 | 3604.33±32.66 | 3607.65±33.48 | 3588.63±26.86 |
| FCR | 1.88±0.02 | 1.90±0.04 | 1.88±0.02 | 1.94±0.03 |

Group I=Chicks reared on paddy husk, Group II=Chicks reared on paddy straw, Group III=Chicks reared on pine leaves, Group IV=Chicks reared on combination of paddy straw and pine leaves, FCR: Feed conversion ratio, SE=Standard error

| Table-3: Mean±SE of weekly body weight of chicks. |
|----------------------------------------------------------|
| Age (weeks) | Body weight (g/bird) |
|------------|----------------------|
|            | Group I | Group II | Group III | Group IV |
| 1          | 258.37±4.02 | 250.50±3.98 | 257.33±4.37 | 260.60±3.75 |
| 2          | 478.80±6.32 | 474.47±8.11 | 496.07±7.61 | 476.60±7.32 |
| 3          | 735.13±11.44 | 710.03±13.33 | 731.20±12.68 | 720.83±13.63 |
| 4          | 1036.00±20.15 | 1053.93±21.84 | 1073.86±19.85 | 1064.50±18.79 |
| 5          | 1516.90±27.71 | 1441.20±25.87 | 1500.10±24.21 | 1428.40±21.68 |
| 6          | 2018.83±31.11 | 1983.80±33.27 | 2007.36±35.73 | 1938.43±36.35 |

Group I=Chicks reared on paddy husk, Group II=Chicks reared on paddy straw, Group III=Chicks reared on pine leaves, Group IV=Chicks reared on combination of paddy straw and pine leaves, SE=Standard error

| Table-4: Mean±SE of weekly feed intake of chicks. |
|----------------------------------------------------------|
| Age (weeks) | Weekly feed intake (g/bird) |
|------------|-----------------------------|
|            | Group I | Group II | Group III | Group IV |
| 1          | 179.13±1.16 | 177.76±0.81 | 180.13±1.09 | 180.17±0.27 |
| 2          | 359.27±12.14 | 358.73±14.97 | 358.50±10.56 | 347.70±12.71 |
| 3          | 449.4±10.85 | 453.47±6.95 | 455.70±6.96 | 447.50±4.90 |
| 4          | 653.67±13.56 | 668.50±7.85 | 653.13±2.69 | 670.47±6.46 |
| 5          | 931.50±7.39 | 892.37±36.48 | 910.33±14.77 | 890.63±12.26 |
| 6          | 1050.50±5.79 | 1053.50±3.27 | 1049.86±7.76 | 1052.16±3.91 |

Group I=Chicks reared on paddy husk, Group II=Chicks reared on paddy straw, Group III=Chicks reared on pine leaves, Group IV=Chicks reared on combination of paddy straw and pine leaves, SE=Standard error

| Table-5: Effect of litter type on evisceration rate and proportion of premium parts of the carcass. |
|----------------------------------------------------------|
| Parameters (%) | Carcass characteristics |
|                | Group I | Group II | Group III | Group IV |
| Eviscerated WT | 65.16±1.04 | 63.98±0.80 | 64.38±0.90 | 62.70±0.44 |
| Breast | 32.72±1.57 | 29.92±0.24 | 31.67±0.51 | 28.47±1.82 |
| Thigh | 16.87±0.28 | 17.74±0.29 | 16.18±0.92 | 17.62±0.43 |
| Giblet | 7.21±0.04 | 4.37±0.08 | 7.18±0.03 | 5.78±0.66 |

*a, bMean values bearing different superscripts in a row differ significantly (p<0.05). Group I=Chicks reared on paddy husk, Group II=Chicks reared on paddy straw, Group III=Chicks reared on pine leaves, Group IV=Chicks reared on combination of paddy straw and pine leaves. Note: Expressed as (') per cent of body weight, ("') per cent of eviscerated weight
the litter among various groups. The nitrogen content was higher in Group III and lowest in Group I, the phosphorus content was higher in Group III and lowest in Group II and the potassium content was higher in Group III and lowest in Group II. Ammonia concentration was calculated by following the procedure as employed by Moum et al. [28]. For the purpose of ammonia estimation, each pen was covered with a transparent plastic sheet. A pH paper strip having a range of 6-7.7 and 9.5, moistened with sterile neutral water was held for 15 s at the level of birds in each pen. It was found that the ammonia production was significantly lower in Group III and lowest in Group II. Ammonia concentration in the different treatment groups was between 25 and 50 ppm (parts per million).

Discussion

In the present study, broilers reared in Group IV had the lowest body weight in comparison to Group I, II, and III (Table-2). The observed differences in body weight may be attributed to depression of feed intake in birds reared in Group IV and increasing feed intake on others litter especially on paddy husk (Table-3 & 4). Our result were in accordance with Atapattu and Wickramasinghe [34], and Grimes [35] who also reported no significant effect of the type of litter material on FCR [3,32-34]. The bedding type had no influence on the carcass characteristics viz. evisceration rate and proportion of cut-up parts of the carcass except the gillet yield. Our results were in accordance with Atapattu and Wickramasinghe [34], and Grimes [35] who also did not find any significant effect of the type of litter on the carcass characteristics.

The bacterial load were slightly higher in Group IV and lower in Group III showing a non-significant difference (Table-6) which is similar to Estevez [36] who also observed higher incidence of E. coli infection in a combination of ammonia and wet litter. The coccidial load in Group IV was higher and lower in Group III. Coccidial infection was mainly influenced by the moisture content of the litter. Moisture content was highest in Group IV (25.69±1.79) and lowest in Group III (22.53±1.40). Waldenstedt et al., [37] also reported that the frequency of outbreaks of coccidiosis in chicks reared under damp and moist conditions was higher.

The nitrogen content reported in our finding has no significant difference among various litter material which was consistent with the Biswas et al., [38] who also reported no significant effect of bedding material viz. sugarcane bagase, sawdust and wheat straw on the N content of the litter. Whereas K and P contents in wheat straw were reported to be significantly higher as compared with other litter materials which may be due to the difference in the initial content of these nutrients in the type of bedding materials used by these workers. However, our result was contradicted in relation to P and K content in litter material.

Conclusion

In conclusion, it may be stated that paddy straw and pine leaves could be used as an alternate litter to commonly used paddy husk to promote the economical intensive poultry production system.
Authors’ Contributions

GS was the MVSc scholar of the division who carried out experimental research work and laboratory analysis of data. AK was guide of GS, under whose supervision, the thesis was submitted. AK planned and designed the experiment; provide needful guidance to execute the proposed experimental design, executed statistical analysis of data, drafted and revised the manuscript as per journal format. AK was head of the division. SS and AKA help in evaluating the proximate principle and manorial value of various litter samples. All authors read and approved the final manuscript.

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Competing Interests

The authors declare that they have no competing interests.

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