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Effect of bedding material on hematobiochemical parameters of Osmanabadi goat kids

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Abstract
Indian goats make a substantial contribution to the national economy and play a significant role for nutritional security especially in rural areas. Goats are a very important species of livestock in India, owing to their short generation intervals, higher rates of prolificacy and requirement of less space for rearing in comparison to large animals. Bedding materials play a noteworthy role in providing a restful microenvironment to animals under intensive production system. The objective of the present study was to evaluate the effect of bedding material on hematobiochemical parameters as an assessment of growth of Osmanabadi goat kids. The experiment was conducted at seed center for osmanabadi goats, Directorate Research Service farm (DRS), DSVCKV, Anjora, Durg (Chhattisgarh). A total 18 Osmanabadi goat kids were divided into three groups i.e. 6 in each group. The kids in control group (T0) were reared on concrete floor without any bedding material, while kids in treatment groups T1 and T2 were kept on wood shavings and straw bedding respectively. A statistically non-significant difference in mean total erythrocyte count (TEC), total leucocyte count (TLC), packed cell volume (PCV), haemoglobin (Hb), total plasma protein, albumin and globulin at beginning of the experiment was observed. However, TEC, PCV, Hb, total protein and albumin values were significantly higher at 60th day of the experiment. Taken together, our results concluded that straw bedding could ameliorate the stress on growing kids in a better way compared to other groups.

Keywords: Osmanabadi goat kids, bedding material, hematobiochemical, welfare

Introduction
Unlike the large ruminant, goat rearing does not require much input cost, commonly popularized as poor man's cow (Ali, 2007) [1]. Due to gradual change in husbandry practices from extensive to intensive housing system became one of the vital inputs for goats (Thakur *et al*., 2017) [14]. Selection of bedding material is of paramount significance as bedding has a potential impact on the important economic traits. It is a decisive factor of indoor housing system for livestock while, it can influence animal hygiene, growth and welfare. The animals that are reared on soft floor are more active, healthy and calm as compared to harder floor (Loynes, 1983) [7]. Goats are normally housed on soft organic materials (e.g. wood shavings, straw) however; some organic substrates may be difficult to access by farmers due to their higher cost. Since inadequate bedding material can critically compromise wellbeing of animals even in well-managed practices, thereby it becomes imperative to provide suitable bedding material for livestock. For goat kids, bedding material is a vital component of housing especially during winter months. Moreover, during the post weaning period, growth rate of kids is a vital production trait. Improper housing conditions may negatively influence the growth rate of kids post-weaning.
With this background, the study was undertaken to take an insight into the effect of locally available bedding materials (viz. straw and wood shavings) on hematobiochemical parameters of Osmanabadi goat kids so that assessment of their health, well-being and growth can be made.

Materials and Methods
The present study was conducted at Seed centre for Osmanabadi goats under Directorate Research Service (DRS), DSVCKV, Durg (CG) during winter season of 2020-21. Durg is situated at height of 317 meters above mean sea level at Latitude & Longitudes between 20°23' and 22°02' N & 80°46' and 81°58 E respectively. The total duration of experiment work undertaken was of 60 days.

Total 18 Osmanabadi weaned kids of 2-3 month age were selected and were randomly divided in 3 treatment groups *viz* T0, T1 and T2 groups with 6 animals in each group. Standard management practices were adopted and all selected kids were dewormed before starting the experiment. The animals were kept in a well ventilated, pucca floored house with free access to clean water (*ad libitum*).

Bedding material

All the animals of control or T0 group were kept on concrete floor without bedding material. T1 group animals were kept on concrete floor with wood shaving. Likewise, for T2 group animals bedding material was straw.

Haematological parameters

Blood samples were collected on 0th day, 30th day and 60th day of trail. About 3 ml blood was collected through jugular vein puncture from each experimental kid (before feeding) in the morning. Blood samples were collected in anticoagulant EDTA containing test tube. Blood haemoglobin was analysed by using Sahli's haemoglobinometer. Total erythrocyte count (TEC) and total leukocyte count (TLC) was enumerated by using Neubauers counting chamber according to the method described by Jain (1989) [4] and expressed in million /µl and thousands/µl respectively. Packed cell volume (PCV) was analysed using the micro-haematocrit method as described by Jain (1989) [4]. For biochemical parameters, samples were analysed for blood glucose, total protein, albumin, and globulin, in semi-auto analyser by using diagnostic kits (Erba diagnostics Mannheim) as per the method recommended by manufacturer.

Statistical analysis

The data obtained was analysed by one way analysis of variance as per Snedecor and Cochran (1994) [10]. If significance of difference existed, DMRT (Duncan's Multiple Range Test) was applied as per method given by Steel and Torrie (1980) [11]. The data were analysed using SPSS software version 25.

Results and Discussion

Effect of bedding material on haematological parameters

Total erythrocyte count (TEC): A statistically non-significant difference in mean TEC at beginning of the experiment was observed (Table 1). The TEC of T0, T1 and T2 group on day 0 was 13.7±0.14, 13.65±0.16 and 14.00±0.16 (×10^6/µl) respectively. A gradual rise in TEC values in all three groups was recorded on day 30 of the study. Furthermore, on day 60th a significant difference in the mean TEC of T2 14.55±0.17 (×10^6/µl) group was observed compared to T0 (14.01±0.13) and T1 (14.02±0.14) group. In present study, group T2 exhibited higher value for TEC variable which escalated significantly on day 60th compared to other groups. In contrast, Antil *et al*. (2019) [2] conducted a study on Barbari goat kids and compared plastic slats and rubbers mats as bedding materials with soil as control. It was found that bedding material did not have a significant effect on TEC of kids. Similarly, Teixeira *et al*. (2015) [12] also did not observe any significant changes in TEC of lambs on different bedding except for sawdust. These variations may be due to dissimilar types of bedding material used, possible breed and species differences. Group T2 kids showed a consistent higher TEC values which might be an indicator of better growth rate.

Table 1: Mean ± S.E. of total erythrocyte count (×10^6/µl) in Osmanabadi goat kids

Day	Overall mean	T0	T1	T2	P value
Initial (0 day)	13.78±0.092	13.7±0.14	13.65±0.16	14.00±0.16	0.275
30 day	13.95±0.096	13.90±0.09	13.78±0.19	14.16±0.17	0.264
60 day	14.55±0.10	14.01^a±0.13	14.02^a±0.14	14.55^b±0.17	0.038

Mean bearing different superscript within a row differed significantly, *P≤0.05.

Haemoglobin (Hb): The result of effect of bedding material on Hb (g/dl) of Osmanabadi goats is given in Table 2. On day 0 mean haemoglobin of T0, T1 and T2 groups was 9.56 ± 0.53, 9.50 ± 0.63 and 10.13 ± 0.62 g/dl respectively. A slight rise in mean Hb was recorded on day 30 in T1 and T2 groups. Furthermore, a significant higher Hb% was observed on 60th day in T2 (11.56±0.32) group as compared to T1 (10.26±0.38) and control (10.13±0.37).

The present results are in agreement with Teixeira *et al.* (2012) [13] who reported a significantly higher haemoglobin in the fattening lambs raised with straw. Again, Teixeira *et al.* (2015) [12] found that sawdust bedding had significant effect on haemoglobin of lambs than rice husk, straw and cellulose. Contrary to present findings, Antil *et al*. (2019) [2] documented no significant difference in haemoglobin value in Barbari kids raised on different type of bedding during winters. Similarly, Thiruvenkadan *et al*. (2009) [15] reported lower haemoglobin values in kids raised on different type of floors during winters. This may pertain to difference in types of bedding materials used, breed variations and difference in agroclimatic conditions.

Table 2: Mean ± S.E. of haemoglobin (g/dl) of Osmanabadi goat kids

Hb (g/dl)	Overall mean	T0	T1	T2	P value
Initial (0day)	9.61±0.30	9.56±0.53	9.50±0.63	10.13±0.62	0.482
30 day	10.15±0.22	9.33±0.38	9.76±0.50	10.76±0.39	0.155
60 day	10.64±0.24	10.13^a±0.37	10.26^a±0.38	11.56^b±0.32	0.020

Mean bearing different superscript within a row differed significantly, *P≤0.05.

Total leukocyte count (TLC): On day 0 the average total leukocyte count of T0, T1 and T2 group was 10.60±0.48, 10.58±0.26 and 10.48±0.34 (10^3/µl) (Table 3) respectively. On day 60th of study the average TLC values of T0, T1 and T2 group was 9.76±0.29, 10.60±0.34 and 9.93±0.40 (10^3/µl). There was no significant difference of TLC among the groups. The mean total leukocyte count of all the observation of all the groups was comparative and comes under the normal range (8000-12000 (10^3/µl) (Reece, 2005) [8].

No significant difference in TLC variable was found in all groups throughout the study period. Moreover, the minor differences that observed for TLC were always within the normal range. Our results are in accordance to Teixeira *et al.* (2015) [12] and Antil *et al*. (2019) [2] who revealed that provision of bedding material in growing lambs and kids did not exert significant effect on TLC. From the TLC results obtained, it can further deduce that none of two types bedding materials used triggered major stress in kids.

Table 3: Mean ± S.E. of total leukocyte count (TLC) (×10^3/µl) of Osmanabadi goat kids

Day	Overall mean	T0	T1	T2	P value
Initial (0day)	10.55±0.87	10.60±0.48	10.58±0.26	10.48±0.34	0.973
30 day	10.48±0.98	10.70±0.51	10.43±0.49	10.33±0.57	0.881
60 day	10.10±0.20	9.76±0.29	10.60±0.34	9.93±0.40	0.237

NS: Non-Significant.

Packed cell volume (PCV): At the start (day 0) and middle (day 30) the mean PCV did not vary significantly among the groups (Table 4). However, on 60th day the mean PCV of T2 group (25.50±0.42) was significantly higher than T0 (22.33±0.66) and T1 (23.00±0.73) group.

A significantly elevated level of PCV value was found in T2 group on day 60 of the study compared to T1 and control. Previously, Teixeira *et al*. (2015) [12] documented that in the lambs on sawdust bedding, an increase in haematocrit values was found between days 1 and 8. Antil *et al.* (2019) [2] observed that PCV was not significantly affected by different bedding materials.

Table 4: Mean ± S.E. of packed cell volume (PCV%) of Osmanabadi goat kids

Day	Overall mean	T0	T1	T2	P value
Initial (0 day)	20.56±0.38	19.67±0.49	20.67±0.76	21.33±0.61	0.206
30 day	22.17±0.32	21.63±0.33	22.00±0.57	22.33±0.70	0.342
60 day	23.61±0.04	22.33^a±0.66	23.00^a±0.73	25.50^b±0.42	0.006

Mean bearing different superscript within a row differed significantly, ***P*≤0.01.

Effect of bedding material on biochemical parameters

Total protein: The result of effect of bedding material on total protein (g/dl) of Osmanabadi goats is shown in (Table 5). The results showed no significant difference in the total protein (g/dl) at the beginning (0 day) and on day 30th of experiment between the groups. However, at 60th day the mean total plasma protein of T2 group (7.12±0.11g/dl) was significantly (*P*≤0.05) higher than the T0 group (6.67±0.06) and T1 group (6.81±0.08 g/dl).

A significantly higher total plasma protein in T2 group can be conferred an indicator of better health and welfare of kids on straw bedding. Blood biochemical variables such as total protein and albumin may be vital measure of effect of stress on animals (Sejian *et al*., 2010) [9]. The result of the present study is in accordance with the finding of Antil *et al*. (2019) [2] who observed that bedding material had significantly affect on plasma total protein. In contrary to our findings Keane *et al*. (2017) [6] compared straw with the concrete floor on total plasma protein of finishing beef heifers and found significantly lower total plasma protein in heifers kept in straw bedding on 42nd day of experiment. However, the values were within the normal range suggesting no effect on protein metabolism.

Table 5: Mean ± S.E. of total protein (g/dl) of Osmanabadi goat kids

Day	Overall mean	T0	T1	T2	P value
Initial (0day)	6.74±0.80	6.65±0.09	6.71±0.13	6.87±0.18	0.548
30 day	6.71±0.04	6.68±0.05	6.65±0.64	6.81±0.08	0.259
60 day	6.87±0.06	6.67^a±0.06	6.81^a±0.08	7.12^b±0.11	0.011

Mean bearing different superscript within a row differed significantly, ***P*≤0.01

Albumin: The initial average albumin value (g/dl) of T0, T1 and T2 group was 2.74 ±0.15, 2.63 ± 0.09 and 2.75 ±0.13 g/dl respectively (Table 6). However, at the end of the experiment average albumin (g/dl) of T0, T1 and T2 group was 2.76±0.04, 2.96±0.14 and 3.23±0.07 respectively. The average value of T2 group was significantly (*P*<0.05) higher than T0 group but similar to group T1. All the values of plasma total albumin were under the normal range (27-39 g/L) for healthy goats as cited by Kaneko *et al*. (2008) [5].

Results of the present investigation are in agreement with Antil *et al.* (2019) [2] who found that there was no significant differences between albumin value of kids and different bedding materials. In other species study, Keane *et al*. (2017) [6] compared straw with the concrete floor on total plasma albumen level of finishing beef heifers and found no significant difference between treatment and control groups. Our findings suggest that there was no adverse effect of bedding substrates on the protein metabolism.

Table 6: Mean ± S.E. of albumin (g/dl) of Osmanabadi goat kids

Day	Overall mean	T0	T1	T2	P value
Initial (0 day)	2.71±0.71	2.74±0.15	2.63±0.09	2.75±0.13	0.779
30 day	2.78±0.71	2.75±0.14	2.60±0.10	2.97±0.85	0.096
60 day	2.95±0.64	2.76^a±0.04	2.96^{ab}±0.14	3.23^b±0.07	0.052

Mean bearing different superscript within a row differed significantly, **P*≤0.05

Globulin: The initial average globulin (g/dl) of T0, T1 and T2 group was 3.90±0.14, 4.07±0.10 and 4.12±0.15 g/dl respectively (Table 7). And at the end of the experiment value was 3.91±0.05, 3.83±0.12 and 3.84±0.16 g/dl. There were no significantly differences observed between the groups. All the values of globulin were under the normal range (27- 41 g/L) for healthy goats as per Kaneko *et al*. (2008) [5]. Our findings of globulin value are in accordance with earlier scientist Antil *et al.* (2019) [2] who observed non-significant difference in the mean plasma globulin value of kids reared on different bedding material. In other species study, Keane *et al*. (2017) [6] compared straw with the concrete floor on total plasma globulin level of finishing beef heifers and found no significant difference between treatment and control groups. Straw and wood shaving bedding materials posed no negative impact on the metabolism of plasma protein.

Table 7: Mean ± S.E. of globulin (g/dl) of Osmanabadi goat kids

Day	Overall mean	T0	T1	T2	P value
Initial (0day)	4.03±0.07	3.90±0.14	4.07±0.10	4.12±0.15	0.525
30 day	3.93±0.07	3.92±0.14	4.05±0.11	3.99±0.10	0.504
60 day	3.91±0.06	3.91±0.05	3.83±0.12	3.84±0.16	0.591

NS: Non-Significant.

Glucose: The result of average plasma glucose concentration is presented in Table 8. The values of mean plasma glucose were under normal physiological range (80-120 mg/dl) in control and treatment groups (Reece, 2005) [8]. The value of total glucose in T0 group ranged from 93.96±2.08 to 97.88±3.92, T1 from 94.27±4.09 to 95.04±2.73 and T2 from 91.90±1.37 to 94.93±3.02. The result showed no significant difference in average plasma glucose concentration between the groups. Our results exhibited that the mean plasma glucose level of kids increased in T0 and T_1 group at the end of the experiment as compared to the beginning but decreased in straw bedded kids. However, our data showed non-significant difference with in groups.

Among all groups, lowest average plasma glucose concentration was observed in T2 group towards the end of trial (day 60). According to Apple *et al*. (1995) [3] stress or

physical exercise increases the level of circulating adrenaline, which causes catabolism of muscle glycogen for gluconeogenesis and increases glucose level. Thereby, lower glucose concentration may further indicate less stress posed by straw bedding compared to wood shavings and concrete. Similar findings have been reported by Teixeira and co-workers (2015) [12] who found plasma glucose level was highest on day 1 and lowest on day 8th of trial on straw bedding than on rice husk and cellulose bedding.

Table 8: Mean ± S.E. of glucose (mg/dl) of Osmanabadi goat kids

Day	Overall mean	T0	T1	T2	P value
Initial (0day)	94.39±1.62	93.96±2.08	94.47±4.09	94.93±3.02	0.940
30 day	94.60±1.53	96.20±2.05	94.31±3.91	93.23±2.47	0.668
60 day	94.93±1.43	97.88±3.92	95.04±2.73	91.90±1.37	0.549

NS: Non-Significant.

Conclusion

From the experimental results, it can be concluded that straw bedding offered certain advantages in ameliorating the stress on growing kids as compared to wood shavings and concrete. Higher values of key haematological as well as biochemical parameters for straw bedding group may be regarded as an indicator of better health, growth and welfare of kids.

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References

1. Ali J. Livestock sector development and implications for rural poverty alleviation in India. Livestock Research for Rural Development. 2007;2:1-15.
2. Antil M, Rai B, Ramchandran N, Gangwar C, Somagond A. Haemato-biochemical and physiological response of Barbari kids to different bedding material during winter. International Journal of Current Microbiology and Applied Science. 2019;8(2):1829-1836.
3. Apple JK, Dikeman ME, Minton JE, McMurphy RM, Fedde MR, Leith DE, *et al*. Effects of restraint and isolation stress and epidural blockade on endocrine and blood metabolite status, muscle glycogen metabolism, and incidence of dark-cutting longissimus muscle of sheep. Journal of Animal Science. 1995;73:2295-2307.
4. Jain GC. Schalm's Veterinary Haematology. Edn 4, Lea and Febiger, Philadelphia, 1989.
5. Kaneko JJ, Harvey JWM, Bruss L. Clinical biochemistry of domestic animals. Edn. 6, Burlington, MA: Academic Press, 2008.
6. Keane MP, McGee M, O'Riordan EG, Kelly AK, Earley B. Effect of space allowance and floor type on performance, welfare and physiological measurements finishing beef heifers. Animal. 2017;11(12):2285-2294.
7. Loynes IJ. Sheep house design. Housing sheep. Farm Building Information centre. Kenilworth, Stoneleigh, UK, 1983.
8. Reece WO. The composition and functions of blood. Duke's physiology of domestic animals. Edn. 12, 2005, 26-52.
9. Sejian V, Srivastava RS, Varshney VP. Effect of short-term thermal stress on biochemical profile in Marwari goats. Indian Veterinary Journal. 2010;87:503-505.
10. Snedecor GW, Cochran WG. Statistical Methods. Edn 8, Oxford and IBH. The Iowa State University Press, Ames, Iowa, USA, 1994.
11. Steel RGD, Torrie JH. Principle and Procedures of Statistics. A biometrical approach. Edn 2, McGraw-Hill, New York, USA, 1980.
12. Teixeira DL, Miranda-de la Lama G, Villarroel M, Olleta JL, García-Belenguer S, Escós J, *et al*. Effects of alternative bedding substrates on lamb welfare, productive performance, and meat quality during the finishing phase of fattening. Journal of Veterinary Behaviour. 2015;10:171-178.
13. Teixeira DL, Miranda-de la Lama GC, Villarroel M, Garcia-Belenguer S, Sañudo C, Maria GA. Effect of straw on lamb welfare, production performance and meat quality during the finishing phase of fattening. Meat Science. 2012;92:829-836.
14. Thakur A, Malik DS, Kaswas S, Saini AL. Effect of different floor space allowance on the performance and behaviour of Beetal kids under stall-fed condition. Journal of Animal Research. 2017;51:776-780.
15. Thiruvenkadan AK, Murugan M, Karunanithi K, Muralidharan J, Chinnamani K. Genetic and nongenetic factors affecting body weight in Tellicherry goats. South African Journal of Animal Science. 2009;39(1):107-111.