Journal of Entomology and Zoology Studies

Available online at www.entomoljournal.com

E-ISSN: 2320-7078
P-ISSN: 2349-6800
JEZS 2019; 7(1): 997-1000

Received: 22-11-2018
Accepted: 28-12-2018

Mohit Antil
Livestock Production Management division, Indian Veterinary Research Institute, Izatnagar, Bareilly, Uttar Pradesh, India

Sandeep Chhikara
Veterinary Surgeon, Department of Animal Husbandry and Dairying, Haryana, India

Dhawal Kant Yadav
Livestock Production Management division, Indian Veterinary Research Institute, Izatnagar, Bareilly, Uttar Pradesh, India

Correspondence
Mohit Antil
Livestock Production Management division, Indian Veterinary Research Institute, Izatnagar, Bareilly, Uttar Pradesh, India

Bedding material: A critical component of housing of goat kids during winters: A Review

Mohit Antil, Sandeep Chhikara and Dhawal Kant Yadav

Abstract
Bedding material is one of the most vital components of housing of kids during winters. The bedding material can help in augmentation of animal welfare and health. Thermal conductivity, softness, cleanliness and slipperiness are considered some of the pivotal characteristics of bedding material for farm animals. The stress induced by extreme of climatic conditions is abated by the bedding material, hence providing a favorable microclimate to the kids. Better physical properties of bedding materials translates into increased cleanliness which ultimately leads to reduced incidence of diseases, structural disorders like lameness and internal parasites. Good bedding material helps the farmer to achieve better growth rates of kids even during severe winter by having positive effect on the physiological, metabolic and haematological profiles of kids.

Keywords: Bedding material, winter, Goat kids, Performance

1. Introduction
Bedding material is an intrinsic component of housing establishment provided to the kids in early stages of life especially during hostile winter conditions [2]. It exhibits direct effects through the neuro-endocrine system, pertaining to conservation of heat to maintain homeostasis. Exposure to cold stress in kids leads to utilization of the energy available for different productivities to maintain a thermal balance between the heat they produce or gain from their environment [18]. This is clearly manifested through increment in metabolism leading to heat production during winters to maintain body temperature. There is a requirement of efficient use of bedding material which can ascertain satisfactory growth and welfare of kids during winters.

The bedding material can help in augmentation of animal welfare and health. Lack of appropriate bedding may lead to uncomfortable conditions during winters, which consequentially hampers the productivity of livestock making them prone to different diseases and parasitic infestation (internal and external). The ability to moderate the extremes of climatic stress and providing favorable microclimate is an essential function of the bedding material [22]. Microclimate maintained within the thermo-neutral zone of animal ensures devotion of maximum energy towards productive purposes.

The pivotal characteristics of bedding material for farm animals are considered to be thermal conductivity, softness, cleanliness and slipperiness. These characteristics affect both animal preferences and thermoregulatory behavior. Moreover, some bedding materials are quite resistant to pathogenic bacteria build-up and thus reduce the prevalence of disease during susceptible winter period floor [8].

2. Effect of bedding material on microclimatic variables
A significant effect ($P<0.01$) of housing has been previously reported on climatic variables like Maximum and Minimum temperature, Dry-bulb and Wet-bulb temperature, RH% (Relative humidity) and THI (Temperature Humidity Index). Morning and afternoon RH and THI were found to be significantly ($P<0.01$) different in concrete roof, thatched roof and macro-environment in all the periods [3].

The effects of two different shelter systems on lactating crossbred goats were analyzed. A significantly higher ($P<0.05$) mean relative humidity was reported in concrete floor and semi covered concrete roof (CF-CR) than elevated slotted wooden floor and thatched roof (WF-ThR). The THI values during the morning and afternoon time were reported in thatched roof shed were higher in comparison with concrete roof shed [22].

The effect of a different shelter system on physiological responses was evaluated in crossbred lactating goat and determined that THI values during the morning than evening was higher under thatch roof than concrete roof. The overlapped roof with gunny bags may be a possible cause of higher THI in thatch roof [22].

3. Effect of bedding material on performance of goat kids

3.1 Effect of bedding material on growth performance and feed intake of goat kids

Better growth rates of sheep were reported when raised on the slatted floor [25]. Similarly, Sundaram *et al*. [24] found Madras Red lambs reared in slatted floor gained higher (P<0.05) body weight than those under mud floor.

Housing system had a significant (P<0.01) effect on body weight of Romanov lambs and the weight gain were found higher when housed on deep litter as compared to indoor housing on the slatted floor [15]. Proper housing provides one means of modifying stressful environmental conditions [21].

The effect of housing systems on total DMI, feed conversion efficiency and body weight of female crossbred kids under three different housing systems was significant (P<0.01) viz., concrete floor with a concrete roof, Kuchcha floor with thatch roof and raised-slotted floor with thatch roof. The total DMI and DMI per 100 kg body weight gain were significantly (P<0.01) affected by housing systems, age of animal and season with group 3 having the best feed conversion efficiency. DMI kg/day was 0.714 ± 0.040, 0.746 ± 0.047 and 0.754 ± 0.047 for housing 1, 2 and 3, respectively [3].

The body weights of Marwari goats were found to be significantly (P<0.01) affected by the shelter. The lowest body weight (26.3 kg) was recorded in goats kept without shelter in comparison to those kept in pucca house (28.0 kg) and thatched roof shelter (31.1 kg) [20].

The effects of different housing systems were studied on performance of Osmanabadi kids in Konkan region of India. It was found that maximum body weight gains were exhibited by kids raised under thatched roof and slatted flooring system [4].

3.2 Effect of bedding material on physiological variables of goat kids

A rise in corresponding values of pulse rate, respiration rate and rectal temperature and lower values of haemoglobin of animals were reported with increase in ambient temperature. To assess thermal stress in animal rectal temperature, respiration rate and pulse rate seem to be suitable criteria [19].

Air temperature was determined to be a source of inducing variations in body temperature and respiration rate of animals and relative humidity was affected the pulse rate. It was also indicated that respiration counts were most sensitive to atmospheric changes [5]. A significant effect of RH on vital physiological responses i.e. respiration, pulse rate and body temperature of animals at a constant air temperature was reported. There was a significant effect of air temperature on respiration and body temperature at a constant RH without any effect on pulse rate [10].

A significant (P<0.05) effect of housing, period, time (morning and evening) and replication on the body temperature (°C) of crossbred goats was reported. There were significant (P<0.01) effects of replication, period and time on pulse rate of goats, whereas, a non-significant effect of housing and all effect interaction. The respiration rate of goats was significantly (P<0.01) affected by the period and time but not significantly affected by the replication, housing and all effect interaction [3]. The physiological responses (RT, RR and PR) of Tellicherry goats and Mecheri sheep reared in slatted floor shelters were similar to those reared on the conventional mud floor [16].

The effect of thermal environment on cardinal physiological responses of goats was determined. The respiratory rates in the morning, afternoon and mean daily respiratory rates were significantly (P<0.05) higher in hot environment than in moderate and cool environments and in moderate in comparison to cool environment. The morning, afternoon and mean heart rate was significantly (P<0.05) lower in hot environment than in cool and moderate environments. The morning rectal temperatures were significantly (P<0.05) higher in a hot environment than in cool and moderate environments. There was no significant difference in afternoon rectal temperature between cool and hot environments. Well protected goats in shed did not show any significant difference in their mean rectal temperature in three thermal environments [17].

The effects of slatted floor in ameliorating the effects of cold stress in Black Bengal goats at the Instructional Livestock Farm, OUAT (Odisha) were evaluated. Different vital physiological signs, serum biochemical parameters, stress hormone like cortisol and browsing behavior were studied to assess the level of stress in the two flooring pattern. Serum haptoglobin and cortisol were assayed as stress indicators in goats. The morning rectal temperature in control and treated groups (101.80 ± 0.13 vs. 100.54 ± 0.06 0F) in winter season exhibited statistically significant variation (P<0.05). The evening rectal temperature were significantly higher (P<0.05) in the control group (102.39 ± 0.07 vs. 101.07 ± 0.11 0F). Significantly higher (P<0.05) respiration rate was evident in the control group than treatment during the evening (25.84 ± 0.88 vs. 21.87 ± 0.79). The morning, evening and the overall pulse rate showed significant lower (P<0.05) values in control than treated animals (72.91 ± 0.49 vs. 75.08 ± 0.33; 78.85 ±0.73 vs. 82.56 ±0.76 and 75.78 ± 0.58 vs. 79.27 ± 0.44) where the slatted floor was given. The heat tolerance indices of control animals were significantly lower (P<0.05) than the treated animals (0.879 ± 0.009 vs. 1.004 ± 0.007). The control group showed non-significantly higher level of cortisol than the treatment group. The control animals showed higher (P<0.05) level of serum haptoglobin than treatment. It was grossly concluded that in winter, slatted floor can be a very good option to alleviate cold stress [2].

3.3 Effect of bedding material on hematological parameters in goat kids

The effect of environment on the hematological performance of West African Dwarf goats reared under different management system commonly adopted by farmers in Nigeria (i.e. extensive, semi-intensive and intensive system) was assessed. The experiment was carried out in a completely randomized design using fifteen (15) West African Dwarf (WAD) goats. Result from the experiment shows that pack cell volume (PCV) and Hemoglobin (Hb) values were significantly (P<0.05) influenced by management system. This value ranges from 28.3±1.50 to 31.3±2.52% for PCV and 8.93±0.45 to 10.3±1.57 g/dl for Hb. whereas other parameters such as RBCs, MCHC, WBCs shows no significant (P<0.05) differences in their values. Total serum

protein and Serum glucose reveals significant ($P<0.05$) differences in their values too, with intensively reared goats having higher serum protein and serum glucose values. These values also ranged from 7.14±0.51 to 8.51±0.30 g/dl for total serum protein and 47.75±3.35 to 61.16±3.47mg/dl for glucose respectively [13].

3.4 Effect of bedding material on health of goat kids

The effect of housing system on the incidence of intestinal parasites in pigs was analyzed. A comparison was made between pigs kept in different rearing conditions (group A – extremely extensive, B – extensive and C – intensive) on the basis of intestinal parasitic fauna. Four members of phylum Nematoda (*Strongyloides ransomi*, *Ascaris suum*, *Oesophagostomum dentatum*, *Trichuris suum*) and two members of phylum Apicomplexa (*Isospora suis* and *Eimeria debliecki*) were among Six parasitic species taken into consideration for diagnosis. The pigs from group A and B were reported with highest level of parasite invasion; they were multi-species invasions. Presence of parasitic species in faeces causes economic losses and poses threat to human health and life. This necessitates the implementation of parasitological screening protocols, especially in the extensive rearing conditions [1].

It was determined by the study of prevalence of parasites in Black Bengal goats in Chittagong, that goat maintained on muddy floor was infected more with parasitic infestation than slatted floor and this may be explained as due to low level of hygiene and favored re-infestation [11].

The prevalence of caprine subclinical mastitis was assessed by California mastitis test (CMT) in Mymensingh area and characterized the associated bacterial agents and the risk factors. The overall prevalence of caprine subclinical mastitis (by CMT) was found to be 18.64% and on an udder half basis the prevalence was 15.04%. The older animals with greater parity and longer lactation period were found to be more affected and showed higher prevalence. The disease was much more prevalent in farms where goats were raised under traditional farming system with earthen floors. The bacterial species *Staphylococcus aureus, S. epidermidis* and *Bacillus subtilis* were predominantly isolated from milk of subclinical mastitis positive cases and exhibited varied sensitivity to the antibiotics [23].

The effects of housing on faecal egg count and floor microbial load in stall fed goat sheds were determined. Tellicherry kids were housed in three different stall fed housing systems i.e. conventional housing of pen with concrete floor and run with mud floor (T1), goat housing of elevated wooden slatted floor pen and run with mud floor (T2) and housing made up of elevated polyurethane slatted floor pen and run with mud floor (T3). The kids were equally fed with roughage and concentrate. The Egg per gram (EPG) count of kids on the day of deworming and at 21st, 60th and 90th day of post deworming was found to be significantly higher in T1 group as compared to T2 and T3. The floor microbial was significantly higher in T1group as compared to T2 and T3 groups at the end of the trial [6].

3.5 Effect of bedding material on behavior of goat kids

Animal welfare on slatted accommodation is influenced by stocking density and floor surface type. A study on effect of floor type and space allowance on welfare indicators of finishing steers was undertaken with determination of the effects of space allowance on slatted floors (1.5, 2.0, 3.0 or 4.0 m2 / head) and floor type (slats v. straw) on the welfare of finishing steers as a main objective. Animal behavior (lying, eating and social interactions), blood cell profiles and plasma metabolite, immune status and acute phase protein concentrations were measured. A reduction in time spent lying at was reported ($P< 0.05$) with space allowance < 2 m2/head, whereas an increment was reported on straw beds when compared with animals housed on slats at 3 m2/head ($P<0.05$). Effect of space allowance on group social, aggressive, grooming or stereotypic behaviors was not established. The frequency of social interactions was reduced ($P< 0.001$) at 1.5 m2 when compared with animals housed on straw at 4 m^2/head. There was no effect of space allowance or floor type on blood cell counts, blood metabolites, haptoglobin or fibrinogen levels. Increasing space allowance above 2 m^2/head, but not floor type, increased carcass gain ($P< 0.001$) and decreased feed conversion ratio (kg DM intake/kg carcass gain, $P<0.05$). *In vitro* interferon-7 response was compromised when animals were housed at < 2 m^2/head ($P< 0.05$) but was not affected by floor type. It was concluded that space allowance less than 3 m^2 / animal adversely affected animal welfare [12].

In Sirohi goat a preference was observed for slatted wooden floor followed by slatted plastic and brick floor i.e. 60.44 min, 54.31 min and 26.56 min respectively. He attributed that to the higher thermal resistance of wooden floor which provided maximum comfort to goat [7].

The behaviour of Girgentana goats was studied under two systems of housing i.e. tethered in wooden stalls (TS) and free-housed in a straw-bedded pen (FH) in a semi-open shelter. The housing system had a significant ($P<0.01$) effect on feeding behaviour of Girgentana goats. It was determined that TS treatment led to better well-being and higher milk yield in Girgentana goats [9].

The effect of slatted floor in ameliorating the effects of cold stress was evaluated in Black Bengal goats in Odisha. In winter, the animals spent about 50% time in browsing, 14% in walking, 8% in standing idle and 27% in sitting idle. Lying or sleeping increases the net body contact area with the ground which acts as a potent source of heat loss. In treatment group insulting slatted floor acted as a barrier and helps to maintain the euthermia. In the control group (Cement floor), lack of any insulation put the animals under cold stress. This was reflected in the total time spent in sitting (26.99 and 28.94%) and browsing (50.39 and 48.76%) in control and treatment group respectively [2].

In a study aimed at investigating the preference of ewes for different floor materials at low ambient temperatures. The shorn ewes showed clear preferences for standing/walking and resting on solid floor materials than on slatted floors. Sheep tended to spend a larger proportion of time resting on solid rubber than solid wood in pen. Between the different slatted floor materials we found no significant difference in behavior parameters. Heat conductivity properties were very different between floor materials and the largest temperature drop was observed on solid rubber mat (8.4 °C), while the smallest temperature drop was evident on a layer of straw (3.1 °C). In conclusion, there are other properties than heat conductivity of the materials that influence sheared ewes' preference for floor materials in low ambient temperatures [14].

4. Conclusion

There are several ways in which bedding material can

augment the performance of kids. It can have an ameliorative effect on microclimatic conditions for superior growth of kids. Use of a superior quality of bedding material leads to increment of cleanliness and reduction in disease incidence, structural disorders like lameness and internal parasites. The physiological, metabolic and hematological profiles of kids are positively affected by a good bedding material during winter. Appropriate bedding material enhances welfare of kids during critical weather conditions, thus helping the farmers to achieve the target of better feed intake and growth.

5. References

1. Bartosik J, Rekiel A, Klockiewicz M, Gorski P, Batorska, M. The effect of housing system on the incidence of intestinal parasite infestation in pigs. Journal of Central European Agriculture. 2012; 13(4):760-768.
2. Behera K, Kumar V, Pradhan CR, Sethy K, Behera D, Panigrahy KK. Ameliorative measure for cold in Black Bengal goats in coastal Odisha climate. Indian Journal of Animal Production Management. 2016; 32(1-2):8-13.
3. Bhakat C, Nagpaul PK. Effect of housing systems on the growth performance of crossbred goats. Indian Journal Animal Science. 2005; 75:69-73.
4. Bharambe VY, Shinde SS. Effect of different housing systems on performance of Osmanabadi kids in Konkan region of India. Indian Journal of Small Ruminant. 2014; 20(2):132-133.
5. Bhatnagar DS, Choudhary NC. Influence of climate on physiological reactions in Murrah buffalo calves. Indian Veteterinary Journal. 1960; 37:404.
6. Blessy PG, Godlin P, Kumaravelu N. Faecal Egg Count, Floor Microbial Load And Ammonia Emission Level In Stall Fed Goat Sheds. International Journal of Innovative Research and Advanced Studies. 2017; 4(7):36-39.
7. Das SK. Behavioural response patterns of Sirohi goat in relation to different floor types. Livestock International. 2003; 7(11):18-21.
8. Divyalakshmi D, Kumarvelu N, Ronald BSM, Devi T, Muthuramalingam T, Gnanaraj TT. Comparison of floor microbial load in different systems of floorings in livestock sheds. Indian Veterinary Journal. 2016; 93(10):47-49.
9. Di Grigoli A, Bonanno A, Alabiso M, Russo G, Leto G. Effects of housing system on welfare and milk yield and quality of Girgentana goats. Italian Journal of Animal Science. 2003; 2(1):542-544.
10. Goswami SB, Prem Narain, The effect of air temperature and relative humidity on some physiological indices of buffalo bulls. Indian Journal of Veterinary Science. 1962; 32:112.
11. Hassan MM, Hoque MA, Islam SKMA, Khan SA, Roy K, Banu Q. A prevalence of parasites in black bengal goats in Chittagong, Bangladesh. International Journal of Livestock Production. 2011; 2(4):40-44.
12. Hickey MC, Earley B, Fisher AD. The effect of floor type and space allowance on welfare indicators of finishing steers. Irish Journal of Agricultural and Food Research. 2003; 42(1):89-100.
13. Imasuen JA. Effect of different management environment on haematological performance in west African Dwarf Goats. Journal of Research in Forestry, Wild Life and Environment. 1984; 4(2).
14. Jørgensen GHM, Johanssen JRE, Bøe KE. Preference in shorn sheep for different types of slatted flooring at low ambient temperatures. Small Ruminant Research. 2017; 153:17-22.
15. Kovnerev IP, Smironov AV. The effect of housing conditions on viability of lambs. Ovtsevodstvo. 1988; 2:28-29.
16. Kulkarni VV, Karunakaran K, Murgan B. Performance of stall fed sheep and goats under slatted flooring conditions. In: International Conference on Small Holder Livestock Production System in Developing Countries. Kerala Agricultural University, Kerala, 2000, 24-27.
17. Kumar P, Singh K. Effect of thermal environment on cardinal physiological responses of goats. Indian Journal of Animal Production. 2005; 37(1-2):52-60.
18. Lu CD. Effects of heat stress on goat production. Small Rumin Res. 1989; 2:151-162.
19. Mullick DN, Kehar ND. Seasonal variation in pulse rate, respiration rate, rectal temperature, body weight and haemoglobin in normal Indian cattle. Indian Journal of Dairy Science. 1952; 22:61-65.
20. Patel AK, Mathur BK, Kaushish SK. Effect of shelter management on body weight and milk yield of Marwari goats under arid conditions. In: International Conference on Small Holder Livestock Production System. In Developing Countries. Kerala Agricultural University, Kerala, 2000, 24-27.
21. Pusillo GM, Hoffman MP, Self HL. Effects of placing cattle on feed at two-month intervals and housing on feedlot performance and carcass grades. Journal of Animal Science. 1990; 69:442-450.
22. Rahman A, Nagpaul PK, Singh B. Effect of two different shelter systems on milk yield and composition feed intake, feed conversion efficiency and physiological responses in lactating crossbred goats during winter season. Egyptian Journal of Sheep and Goat Science. 2013; 8(1):81-87.
23. Razi KMA, Rahman MB, Flores-Gutiérrez GH, Rahman MT. Prevalence of caprine subclinical mastitis in Mymensingh area and characterization of associated bacterial agents and the risk factors. Microbes Health. 2012; 1(1):1-5.
24. Sundaram SM, Sivakumar T, Ramesh V, Gnanaraj PT. Comparative performance of Madras Red sheep under different management systems. Indian Journal of Animal Science. 2002; 72(10):904-907.
25. Watson IVM. An economical method of producing lambs relatively free from parasites. Journal of American Veterinary Medicine Association. 1962; 140:58-60.