RESEARCH ARTICLE

# Effect of Different Roofing Material on Body Weight and Feed Intake of Indigenous Sheep under Stall Feeding System

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## Abstract

The present study was conducted to assess the effect of roof on body weight and feed intake of sheared and non-sheared sheep under stall feeding system in the hot dry season. Adult dry indigenous sheep (24) were distributed randomly into two treatment groups, *i.e.,* $T_{1:}$ asbestos roof and $T_2$: agro - net roof. Each treatment comprised of six sheared and six non-sheared animals. Sheep were provided with total mixed ration in morning, afternoon and night individually. The bodyweight of sheared (31.87 ± 2.14, 31.96 ± 1.55 kg) and non-sheared (32.16 ± 1.59, 32.42 ± 1.42 kg) animals was comparable between roof treatments. The experimental animals reared under agro-net roofed shelter consumed significantly ($p < 0.05$) more dry matter and nutrients as compared to animals reared under asbestos roofed shelter. Dry matter and nutrient intake of sheared sheep were significantly ($p < 0.05$) higher as compared to non-sheared sheep under agronet and asbestos roofed shelter. The results indicated that the sheep can be reared comfortably under agronet roof without affecting feed and nutrient intake.

**Keywords:** Bodyweight, Feed and nutrient intake, Roof, Sheared and non-sheared sheep.

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## Introduction

In the semiarid region, sheep farming is one of the most important livelihoods for the poor and marginal farmers. Traditionally sheep are reared under an extensive system, which is influenced by agroclimatic conditions and rigors of nature. However, in organized farms sheep are housed in asbestos roofed sheds with open sides during monsoon and summer and covered sides during winter. In animal housing, roof plays a primary role in determining the animals' thermal exchange (Liberati and Zappavigna, 2004). In hot climate, the high thermal resistance of roof can help reduce the effect of solar radiation; with increasing thermal resistance, there is a possibility of discharging heat through roof during night hours. Therefore, insulated roofing materials in the animal house reduce the diurnal negative effect of radioactive heat load on animals. However, this is an expensive solution and its usefulness depends on various factors, *i.e.,* climate, latitude, building geometry and orientation, constructive solutions, animal physical and spatial parameters (Zappavigna and Liberati, 2007). As the sheep farmers are poor and marginal, they need a low-cost rearing system that can protect the animals from harsh climate. Because of the above-mentioned fact, present investigation was planned to assess the effect of different roofing material on body weight and feed intake of indigenous sheep under stall feeding system in hot dry season.

## Materials and Methods

The study was carried out at Livestock Farm Complex, College of Veterinary Science and Animal Husbandry, AAU, Anand for a period of six weeks during May and June 2019. The institute is locted at 22°: 35'N and 72°: 55' E longitude at an elevation of 45 meter above the mean sea level with a semiarid climate. The maximum temperature in hot dry season was 41.5° C, whereas the minimum temperature was 25.5° C. Animal care, handling and sampling procedures were approved by Institutional Animal Ethics Committee (IAEC).

Twenty four adult dry indigenous sheep (30.43 ± 1.55 kg) were randomly allotted to two different shelter systems, *i.e.,* asbestos ($T_1$) and agro-net ($T_2$) roof with soil floor. Each treatment comprised of six sheared and six non-sheared animals. Experimental animals were maintained on total mixed ration (TMR) and weighed quantity of TMR (2 kg) was offered at morning (8.00 a.m.), afternoon (3.00 p.m.) and night (8.00 p.m.) individually (ICAR, 2013). TMR was prepared at weekly intervals by maintaining roughage to concentrate (65:35) (Vitamin $AD_3$ (60 g/100 kg)). The measured quantity

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of wholesome clean water was offered daily in the morning to experimental animals. Necessary precautions were taken to maintain hygienic conditions in the house. Weekly body weight of experimental animals was recorded during an entire experiment to know the status of animals. Leftover quantity of feed was weighed every morning and daily feed intake records were maintained throughout the experimental period. Proximate principles of TMR were estimated as per the standard methods (AOAC, 2012). Data on body weight and feed intake were analyzed using a completely randomized design (factorial) as per Snedecor and Cochran (1994). Composition of Total Mixed Ration was prepared using Jowar hay (65%), Maize grain (5%), Soyabean meal (15%), De-oiled rice bran (5%), Molasses (9%), Mineral mixture (1%).

## Results and Discussion

On dry matter (DM) basis, the chemical composition of TMR revealed 9.10% crude protein, 27.15% crude fibre, 91% dry Matter, 2.21% ether extract, 52.11% nitrogen free extract, 9.43% ash, 3.69 silica, 2.52% calcium and 0.68% phosphorus

The body weight (kg) of adult indigenous sheep reared under the different roofed house is presented in Table 1. The mean body weight of sheep under asbestos roofed house ($T_1$) at the beginning of an experiment was identical for sheared and non-sheared groups (30.58 ± 1.42 and 30.13 ± 2.11 kg), which increased up to 33.14 ± 1.74 and 33.32 ± 2.18 kg, respectively, at the end of the experiment. Similarly, the identical average body weight of sheared and non-sheared sheep (30.54 ± 1.28 and 30.46 ± 1.38 kg) reared under agro-net roofed house ($T_2$) at the beginning of an experiment was found to be increased up to 33.55 ± 1.59 and 32.69 ± 1.58 kg, respectively, at the end of the experiment. Irrespective of shearing practices, sheep's mean body weight at the end of an experiment did not differ significantly among roof treatment groups (32.01 ± 1.86 and 32.19 ± 1.48 kg, Table 1). There was no effect of housing on sheep's body weight (Bhatta *et al*., 2004), which is in accordance with present findings. Sheep reared under asbestos sheet and agro-net roofed house grew to the tune of 5.92 and 3.30% in relation to their initial body weight (Singh, 2007), which is according to present findings.

Perusal of Table 2 indicated that daily dry matter inatake (DMI, g/d) was significantly ($p < 0.05$) influenced by treatment, shearing practices. The animals kept under agronet roofed shelter ($T_2$) consumed significantly ($p < 0.05$) more dry matter (12.02%) as compared to the animals under asbestos roofed shelter ($T_1$). This may be due to poor wind speed and elevated inside temperature under asbestos roofed house. Irrepective of roof, DMI of sheared sheep was significantly ($p < 0.05$) higher than non-sheared sheep. This may be because the non-sheared sheep couldn't dissipate body heat. Digestible crude protein (DCP) and Total digestible nutrient (TDN) intake (g/d) were significantly ($p < 0.05$) influenced by roof treatment and shearing practices. The animals kept under agro-net roofed house consumed significantly ($p < 0.05$) more DCP and TDN (12.01 and 12.02%) as compared to the animals reared under asbestos roofed house. Similarly, DCP and TDN intake

**Table 1:** Mean ( ± SE) body weight (kg) of sheep managed under different roofing materials

| | *Asbestos roof $T_1$* | | *Agro-net roof $T_2$* | |
|---|---|---|---|---|
| *Body weight (kg)* | *Sheared* | *Non-sheared* | *Sheared* | *Non-sheared* |
| Initial | 30.58 ± 1.42 | 30.13 ± 2.11 | 30.54 ± 1.28 | 30.46 ± 1.38 |
| Final | 33.14 ± 1.74 | 33.32 ± 2.18 | 33.55 ± 1.59 | 32.69 ± 1.58 |
| Mean (T) | 32.01 ± 1.86 | | 32.19 ± 1.48 | |

**Table 2:** Mean ( ± SE) dry matter and nutrient intake of sheep under different roofing materials

| | *Asbestos roof $T_1$* | | *Agro-net roof $T_2$* | |
|---|---|---|---|---|
| *Variables* | *Sheared* | *Non-Sheared* | *Sheared* | *Non-Sheared* |
| *Dry Matter* | | | | |
| Intake, g/d | 1199.56 ± 36.61$^c$ | 1118.72 ± 33.97$^d$ | 1326.20 ± 28.94$^a$ | 1270.71 ± 40.77$^b$ |
| Intake, % body wt. | 3.75 ± 0.11$^c$ | 3.53 ± 0.10$^d$ | 4.11 ± 0.10$^a$ | 3.97 ± 0.10$^b$ |
| Intake, g/kgW$^{0.75}$ | 89.11 ± 2.56$^c$ | 83.63 ± 2.15$^d$ | 97.86 ± 2.23$^a$ | 94.33 ± 2.51$^b$ |
| *Digestible Crude Protein* | | | | |
| Intake, g/d | 64.78 ± 1.98$^c$ | 60.41 ± 1.83$^d$ | 71.61 ± 1.56$^a$ | 68.62 ± 2.20$^b$ |
| Intake, % body wt. | 0.203 ± 0.006$^c$ | 0.191 ± 0.005$^d$ | 0.222 ± 0.005$^a$ | 0.214 ± 0.006$^b$ |
| Intake, g/kgW$^{0.75}$ | 4.81 ± 0.14$^c$ | 4.52 ± 0.12$^d$ | 5.28 ± 0.12$^a$ | 5.09 ± 0.14$^b$ |
| *Total Digestible Nutrients* | | | | |
| Intake, g/d | 707.74 ± 21.60$^c$ | 660.04 ± 20.05$^d$ | 782.46 ± 17.08$^a$ | 749.72 ± 24.06$^b$ |
| Intake, % body wt. | 2.21 ± 0.07$^c$ | 2.08 ± 0.06$^d$ | 2.42 ± 0.06$^a$ | 2.34 ± 0.06$^b$ |
| Intake, g/kgW$^{0.75}$ | 52.58 ± 1.51$^c$ | 49.34 ± 1.27$^d$ | 57.73 ± 1.32$^a$ | 55.66 ± 1.48$^b$ |

Means with different superscripts in a row differ significantly ($p < 0.05$).

were also significantly ($p < 0.05$) influenced by the shearing of sheep, which led to more DCP and TDN intake (5.70%) as compared to non-sheared sheep, perhaps due to more consumption of dry matter by sheared sheep. Irrespective of roof and shearing practices, DMI and nutrient intake of sheep significantly influenced by experimental periods.

The values of DM and nutrient intake of sheep reared under asbestos and agro-net roofed house were comparable to the report of Singh (2007), whereas in an another study, housing had no significant effect on nutrient intake of sheep (Bhatta *et al*., 2004) which is contrary to the with present findings. This may be due to high insulating property of agro-net roof that provides better comfort in hot dry season, resulting in increased feed and nutrient intake of animals. Our results were in agreement with Alqaisi *et al*. (2020), who also found increased dry matter and nutrient intake of sheared Omani sheep as a result of evaporative heat loss that could have been used more effectively in sheared animals due to the absence of fleece. However, Aleksiev (2008) reported that shearing had no effect on feed intake and average DMI was 1779 and 1795 g respectively in unshorn and shorn ewes, which is contrary to the with the present finding.

## Conclusion

The present study indicats that roof type did not influence body weight of adult sheep. High thermal conductivity of asbestos roof could not protect the animal from thermal stress, whereas high insulating property of agro-net roof provided better comfort to the sheep in hot dry season. The results indicated that the agronet roof was better in terms of feed and nutrient intake of sheep under stall feeding system in hot dry season. Irrespective of roof, sheared animals consumed more feed and nutrients as compared to non-sheared animals. Since sheep production in arid and semiarid region varies widely, *i.e*., extensive vs intensive, the combined effect of housing and shearing strategies can be accommodated depending on the farming system.

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## Refrences

Aleksiev, Y. (2008). Effect of shearing on feed intake and milk yield in Tsigai ewes. *Bulgarian Journal of Agricultural Science, 14*(1), 87-92.

Alqaisi, O., Al-Jazmi, F., Al-Abri, M., Al Kalaldeh, M., Al-Sabahi, J., & Al-Marzooqi, W. (2020). Effect of diet quality and shearing on feed and water intake, *in vitro* ruminal methane production, and blood parameters of Omani sheep. *Tropical Animal Health and Production, 52*(3), 1115-1124. Doi: 10.1007/s11250-019-02108-5.

AOAC. (2012). Official Methods of Analysis, 19th edn., Association of Official Analytical Chemists, Virginia, USA.

Bhatta, R., Swain, R., Verma, D. L., & Singh, N. P. (2004). Studies on feed intake and nutrient utilization of sheep under two housing systems in a semiarid region of India. *Asian-Australian Journal of Animal Science, 17*(6), 814-819.

ICAR. (2013). *Nutrients Requirements of Cattle and Buffalo.* Indian Council of Agricultural Research, New Delhi, India.

Liberati, P., & Zappavigna, P. (2004). Performance of ventilated roofs in hot climate. *proceedings of the International symposium of the CIGR, Evora*, Portogallo, May 2-6, pp. 1-8.

Singh, D.N. (2007). Comparative performance of shader and non-shader indigenous sheep under middle Gujarat agro-climatic condition during summer seasons. *M.V.Sc. Thesis*, Anand Agricultural University, Anand, India.

Snedecor, G.W., & Cochean, W.G. (1994). *Statistical Methods*. 7th edn., The Iowa State University Press, Ames. Iowa, USA.

Zappavigna, P., & Liberati, P. (2007). Analysis of the effects of the roofing design on heat stress in dairy cow housing, *CIGR Workshop "Animal Housing in Hot Climate", Cairo, Egypt*, April 1-4