



ISSN: 2456-2912

VET 2024; SP-9(1): 241-243

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Received: 01-10-2023

Accepted: 05-11-2023

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## Effect of different roofing patterns on behavioural responses of Magra lambs in arid region

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### Abstract

The present research study was performed to evaluate the effect of different roofing patterns on behavioural parameters of Magra lambs. The study was performed at Livestock Research station Bikaner. Eighteen Magra lambs of 3-4 months of age were selected from research station and randomly divided into three groups T<sub>0</sub>, T<sub>1</sub> and T<sub>2</sub>. Group T<sub>0</sub> were maintained under tree shed, T<sub>1</sub> were kept under Thatch roof shed and Tin roof shed were provided to group T<sub>2</sub>. Sand floor were provided to all experimental groups. All three groups of lambs were maintained under a similar system of feeding and other management systems. Behavioural parameters such as feeding, drinking, resting, standing, playing and oral stereotypic behaviour of experimental lambs were recorded at weekly interval during morning and evening. Statistical analysis of the data revealed that average feeding behavior of experimental lambs differed significantly ( $p < 0.01$ ) among treatment groups. Average resting behaviour was significantly ( $p < 0.05$ ) higher in T<sub>1</sub> than other groups in morning and evening time ( $p < 0.01$ ). Significant increase ( $p < 0.05$ ) was observed in the average playing activity of group T<sub>1</sub> during morning while non significant difference was observed in evening. Standing, grooming and oral stereotype behaviour was non significantly differed among the treatment groups.

**Keywords:** Roofing patterns, Magra lambs, livestock

### Introduction

Livestock play a significant role in enhancement of national income, employment and prosperity in the rural and urban areas of the country. This sector provides employment opportunities to two-third of rural people of India. The contribution of this sector is 4.11% in GDP and 25.6% in total agricultural GDP. The total livestock population of India is 535.78 million in 2019, among this total sheep population is 74.26 million, increased by 14.1% than previous census (BAHS, 2023) [1]. Magra breed of sheep is popularly known as the "Bikaneri Chokla". This breed is found in Bikaner, Nagaur, Jaisalmer, and Churu districts of Rajasthan. This breed is well known for its lustrous carpet wool. Housing system is considered as one of the most important factor to impact the overall performance of livestock in terms of growth, production, health and reproductive efficiency. Housing design and shade material play an important role in the microclimate modification and reduction of radiant heat load inside the shed (Narwaria *et al.*, 2017) [9]. Roof is an integral part of housing, which prevents the access of solar radiations and rainwater to the livestock and ensures comfort to its inhabitants (Maurya *et al.*, 2023) [8]. In India, sheep do not need huge investment and inputs on their housing and feeding as it provide meat, milk, skin, wool and manure for sustenance of resource to poor, rural and landless farmers. Sheep in India are mostly reared in open spaces not having suitable housing. Behavioural activities of animals are indicator of animal comfort (Cook *et al.*, 2005) [2]. Animal housing should prevent the animal from climate extremes to reduce stress. Productivity of livestock is substantially increased through shelter management by mitigating environmental stress (Nienaber and Hahn, 2007) [10].

### Materials and Methods

The present research study was carried out at Livestock Research Station, Kodemdesar, Bikaner Rajasthan. For the study, 18 Magra lambs (male and female) aged of 3 to 4 months, were selected and randomly distributed into 3 experimental groups and provided the following

housing condition: T<sub>0</sub> (Control having an open area under tree shade with a sand floor). The shaded area was protected by wire fences. T<sub>1</sub> (Thatch roofed shed) Thatch roof shed was constructed with locally available dry grass (Khim) fixed on a bamboo frame with a Sand floor. T<sub>2</sub> (Tin roofed shed) has a tin sheet roofed shed with a sand floor. The research study was performed for 90 days duration. Lambs were kept for an adaptation period of one week before the starting of experiment. All three groups of lambs were managed under similar systems of feeding and other management systems. Lambs were on grazing for 6 hours daily along with grazing dry fodder (ground nut straw) was fed ad lib and commercial concentrate pellet feed (Saras Gold) having 19.8% CP, 70% TDN and 2500 kcal/kg metabolic energy was fed to meet the requirement of nutrient @ 200gms /lamb/day.

### Behavioural observations

Behavioural observations were recorded by personal observation for each group from 9 am to 11 am (Period -1) and from 3 pm to 5 pm (Period -2) once a week. A stop watch was used to record the observation periods.

#### Feeding (min)

Feeding time of different groups of lambs were recorded during morning and evening. Feeding behaviour was observed when different groups of lambs were actively engaged in feeding.

#### Drinking (min)

The frequency of drinking was recorded when lambs were allowed to drink water in sheds.

#### Standing (min)

Standing behaviour of different groups were observed when lambs were in standing position and not involved in other activity.

#### Resting (min)

Behaviour was recorded when lambs were in sitting / resting position inside sheds.

#### Playing (min)

Playing behaviour in group of lambs were observed into various forms such as whole body play (jumping, leaping), social play (butting, chasing) and running.

#### Grooming behaviour (min)

Time spent in self licking, rubbing, scratching among group of experimental lambs was recorded.

#### Oral stereotypic behaviour (min)

Various oral activities such as biting, licking directed to the feeder, waterer, fences or any other inanimate objects were recorded as stereotypic behavior.

#### Statistical analysis

The results of all the experiments were recorded and data obtained were statistically analyzed (Snedecor and Cochran, 1994) [12] for One way Analysis of Variance and Duncan's multiple range tests was conducted to test the significance of difference between mean values.

## Result and Discussion

Results of behavioral responses of Magra lambs during morning and evening have been presented in Table 1 and Table 2.

- 1. Feeding:** Average Feeding behavior of T<sub>0</sub>, T<sub>1</sub> group lambs were significantly ( $p < 0.01$ ) higher than T<sub>2</sub> in morning and evening time. Difference between T<sub>0</sub> and T<sub>1</sub> was non significant. Lambs kept under thatch roof spent more time (19.45 min) in feeding than T<sub>2</sub>, T<sub>0</sub> during evening that indicated more comfortable microclimate condition inside the shed which increased the feeding time in lambs as compare to other sheds.
- 2. Drinking:** Average Drinking behaviour was significantly ( $p < 0.01$ ) higher in group T<sub>0</sub> than T<sub>2</sub> and T<sub>1</sub> during evening time. This might be due to inability of tree shade to protect lambs in hot climatic condition during summer season which increased water demand in lambs.
- 3. Resting:** Results revealed that group T<sub>1</sub> lambs spent significantly ( $p < 0.05$ ) higher time in resting as compared to T<sub>2</sub>, T<sub>0</sub> in morning. Similar trend was observed ( $p < 0.01$ ) in T<sub>1</sub> group lambs during evening time. Less time spent in resting was observed under tree and tin sheet roof indicated less comfort to the experimental lambs.
- 4. Standing:** Mean standing time was numerically higher in all the groups of experimental lambs during morning than evening. The average value of standing time in T<sub>0</sub>, T<sub>1</sub> and T<sub>2</sub> differed non significantly with each other in morning. Statistical analysis of data revealed that T<sub>1</sub> had significant ( $p < 0.01$ ) decreased in standing time than T<sub>0</sub> and T<sub>2</sub> group in evening. No significant difference was observed between T<sub>0</sub> and T<sub>2</sub>.
- 5. Playing:** A significant difference ( $p < 0.05$ ) was observed in average playing behavior among all experiment groups during morning time. The mean value of No significant difference was observed among all groups regarding playing behaviour during evening hours. Lambs kept under thatch roof showed increased playing activity as compared to other sheds during hot hours of day. However playing activity in all group were more during morning as compared to hot hours of day. It might be due to increased energy level in lambs during morning time.
- 6. Grooming:** No significant difference was found in mean values of grooming behavior among all the group of experimental lambs in both morning and evening time.
- 7. Abnormal:** Abnormal behavior such as biting, licking feeder and water pot, licking fences fixed around the shed and any inanimate object was observed in lambs kept under different roof materials. Results indicated that abnormal behavior doesn't vary significantly among all groups during morning as well as evening hours, However, increased frequency of abnormal behavior was observed in lambs of control group (T<sub>0</sub>).

Present findings of study are similar with Kamal (2013) [6], De *et al.* (2015) [3], Rokde (2004) [11]. Di Grigoli *et al.* (2003) [5] reported increased standing activity in free housed goats. Jat (2002) reported observed significant decreased standing time in thatch roof and mud plaster roof in lambs. Present findings were in disagreement with Yazdani and Gupta (2000) [13] in calves.

**Table 1:** Mean± SE of Behaviour activities (min/2 h) of experimental lambs in morning

Behaviour parameters	(T <sub>0</sub> )	(T <sub>1</sub> )	(T <sub>2</sub> )
Feeding	22.32 <sup>b</sup> ±0.75**	21.95 <sup>b</sup> ±0.64**	18.31 <sup>a</sup> ±0.58**
Drinking	1.24±0.21	0.96±0.17	0.89±0.20
Resting	8.98 <sup>a</sup> ±0.63*	12.63 <sup>b</sup> ±1.13*	10.91 <sup>ab</sup> ±0.87*
Standing	22.32±1.22	21.67±0.64	21.95±1.09
Playing	14.57 <sup>ab</sup> ±1.56*	16.92 <sup>b</sup> ±0.90*	13.64 <sup>a</sup> ±0.94*
Grooming	1.36±0.39	0.97±0.37	1.05±0.37
Abnormal	1.66±0.40	0.65±0.32	1.05±0.38

Means bearing different superscript in a row differ significantly. \* = ( $p < 0.05$ ) \*\* = ( $p < 0.01$ )

**Table 2:** Mean±SE of Behaviour activities (min/2 h) of experimental lambs in evening

Behaviour parameters	(T <sub>0</sub> )	(T <sub>1</sub> )	(T <sub>2</sub> )
Feeding	14.28 <sup>a</sup> ±0.81	19.45 <sup>b</sup> ±0.53	15.24 <sup>a</sup> ±0.98
Drinking	4.35 <sup>b</sup> ±0.34	2.30 <sup>a</sup> ±0.25	3.45 <sup>b</sup> ±0.48
Resting	21.86 <sup>a</sup> ±1.02	29.64 <sup>c</sup> ±1.20	26.13 <sup>b</sup> ±1.05
Standing	15.44 <sup>b</sup> ±0.85	13.56 <sup>a</sup> ±1.01	14.96 <sup>b</sup> ±0.65
Playing	6.75±2.19	10.18±0.40	7.11±4.47
Grooming	1.93±0.63	2.95±0.76	1.13±0.39
Abnormal	1.87±0.61	0.69±0.28	1.66±0.57

Means bearing different superscript in a row differ significantly

## Conclusion

Present study concluded the thatch roof as beneficial and economic roofing material as it helps to protected lambs from extreme heat stress in harsh climatic condition of arid zone in Rajasthan during the summer season. Thatch roof prevented direct and indirect solar radiations and created more comfortable micro environment inside the shed which results in better behavioural responses to increased heat load. Lambs kept under thatch roof spent less time in standing and more time in resting and playing activity indicated increased comfort to experimental lambs inside shed.

## Acknowledgement

We wish to thanks Dean, College of Veterinary and Animal Sciences RAJUVAS, Bikaner for providing necessary funds and facilities to conduct the research experiment.

## Conflict of Interest

None

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