Journal of Animal Research: v.13 n.03, p. 393-399. June 2023

DOI: 10.30954/2277-940X.03.2023.13

Effect of Different Floor Types on Growth Performance and Carcass Traits in Stall Fed Nellore Brown Ram Lambs

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Received: 14 Oct., 2022 **Revised:** 20 Feb., 2023 **Accepted:** 02 March, 2023

ABSTRACT

An experiment was conducted to assess the effect of different floor types on growth performance and carcass traits in growing stall fed Nellore brown ram lambs. The research animals were allotted randomly to 3 treatment groups (eight lambs in each group) i.e., on mud floor (control, T1), on concrete floor (T2) and on the elevated plastic slatted floor (T3) in a completely randomized design under intensive system. Statistical analysis of the data showed significantly higher body weight gain in T3 and T2 groups in the fifth fortnight. Significantly ($P<0.01$) higher body weight gain recorded in T3 group from sixth to eighth fortnight among three treatment groups and the total gain in body weight was significantly higher in the T3 group of lambs. Non-significant difference was observed for average daily gain (ADG), feed and dry matter intake (DMI) and carcass traits, but comparatively higher feed intake and DMI was observed in lambs reared on elevated plastic slatted floor (T3). It can be concluded that the overall body weight gain was significantly higher in lambs reared on elevated plastic slatted floor. Though statistically not significant, the higher ADG and DMI in lambs reared on elevated plastic slatted floor results in better returns, hence recommended for farmers adoption.

HIGHLIGHTS

- Elevated plastic slatted floor gives greater comfort to the animals.
- Significantly higher ($P<0.01$) body weight gain recorded in stall fed growing Nellore brown ram lambs on elevated plastic slatted floor.

Keywords: Carcass traits, Different floor types, Growth performance, Ram lambs, Stall fed

Sheep and goats play major role in the food chain and livelihood of rural dwellers, where they are considered as the property of women and children (Lebbie, 2004). Small ruminant farming provides income and employment to the poor households of rural society, especially in areas with hills, cliffs, and sparse vegetation. Sheep utilizes grass, browse, and agro-industrial by-products more efficiently and valorizes the waste and biomass to energy and value-added products (Adegbeye *et al*., 2020). Animal products are playing an important role in human nutrition and giving food security as their consumption is desired

How to cite this article: Pandu, R., Chandra, A.S., Harikrishna, C., Venkateswarlu, M. and Vidya, B. (2023). Effect of Different Floor Types on Growth Performance and Carcass Traits in Stall Fed Nellore Brown Ram Lambs. *J. Anim. Res.,* **13**(03): 393-399.

Source of Support: None; **Conflict of Interest:** None

to produce balanced diet at national level. Livestock products, not only represent a source of high-quality food, but equally important as they are the main source of income for many small farmers in developing countries useful for purchasing food and agricultural inputs. Most of the farmers used to rear sheep for their subsistence and hence rarely adopt scientific management practices due to lack of awareness and lack of access to veterinary services (Ramesh *et al.,* 2022). Intensive system of rearing small ruminants is gaining much attention among new livestock entrepreneurs due to the shrinkage of grazing lands and poor fodder quality. The various advantages associated with elevated slatted floor housing for small ruminants is making it more acceptable. Higher initial costs are incurred with the raised floor in sheep houses, probably due to this the research on alternative flooring solutions in sheep production are limited. Frequent recurring expenses, leg stuck problems etc. are noticed with the conventional slatted floor houses where bamboo and wood are commonly used. To overcome these disadvantages, plastic slatted floor materials are being used widely due to better durability, anti-skid nature and better animal comfort. The scientific reports on the effect of plastic slatted floor on the production performance and welfare of animals are sparsely available, though the manufacturers are aggressively marketing it. Keeping in view the importance of flooring, the present study was planned to assess the effect of different floor types on growth performance and carcass traits in Nellore brown ram lambs kept under intensive system of management.

MATERIALS AND METHODS

The present study was undertaken at sheep unit of Livestock Farm Complex (LFC), College of Veterinary Science, Rajendranagar, Hyderabad-30. Twenty four Nellore brown ram lambs with average body weight of 15.32 ± 0.39 kg and aged 3-6 months, procured from Livestock Research Station (LRS), Mamnoor were used for the present study. These lambs were then allotted randomly to 3 treatment groups (eight lambs in each group) i.e., mud floor (control, T1), concrete floor (T2) and elevated plastic slatted floor (T3) in a completely randomized design and kept under intensive system. All the experimental animals in three groups were offered concentrate mixture as being fed to other stock in the farm along with *adlibitum* green fodder (Para grass) and Maize Silage twice in a day i.e., 8.00 AM and 3.00 PM, meeting the nutrient requirements as suggested (ICAR, 2013). All the lambs were allowed to acclimatize to their respective flooring for 7 days and then the study was carried out for a period of 120 days (March to July 2021).

Body weight gain

Body weight of lambs were recorded at fortnightly intervals using a digital electronic weighing balance before offering feed and water in the morning. Total weight gain was calculated by subtracting final body weight from initial body weight.

Average daily gain (ADG)

The average daily gain was calculated by using the following formula;

$$ADG = \frac{\text{Final weight (kg)} - \text{Initial weight (kg)}}{\text{Number of days}}$$

ADG was calculated fortnightly throughout the experimental period.

Dry matter estimation

The DM content of feeds was determined by drying a weighed amount of the sample in a moisture cup overnight at 100 ± 2 ^{o}C to a constant weight. The weight of the dried sample expressed as percentage of the original air-dried sample represented the per cent DM in the sample.

$$\text{Dry matter (\%)} = \frac{\text{Weight of the dried sample weight}}{\text{Weight of sample before drying}} \times 100$$

Feed intake

Feed offered and feed refusal was monitored fortnightly for each group of lambs and feed intake was calculated.

Slaughter method

The representative animals were slaughtered by 'Halal' method after overnight starving. Before slaughter, the live

weight of lambs was recorded. Stripping, legging, dressing and evisceration were performed by adopting the standard procedures described by Gerrand (1964).

Empty body weight (EBW)

Weight recorded after deducting blood and gut fill from pre slaughter weight was noted as EBW.

Dressing percentage

Dressing percentage (DP) was calculated as percentage of hot carcass weight to slaughter body weight (SBW) or empty body weight (EBW) as suggested (Tsegay *et al*., 2013).

Carcass weight

Hot carcass weight (HCW) was determined as the body after removing the skin, head, forefeet, hind feet and all the viscera and fat depots (scrotal fat, pelvic, kidney and gut fat (omental + mesenteric fat)). The warm weight is recorded within 45 minutes of slaughter and before any carcass washing has taken place as recommended (Fisher *et al*., 1994).

Meat to bone ratio

Muscle tissue is generally, visually discrete and is easily discriminated from other tissues. The muscle mass includes the epimysia, but excludes tendons (which are severed at the limit of the red lean tissue at right angles to the tendon axis), the tendinous sheet covering part of M. rectus abdominis and the peritoneum covering the deep surfaces of some of the other abdominal muscles. It also excludes periosteum (which remains attached to the bone) except for those muscles where the periosteum comes off with the lean when it is removed from the bone. Bone includes all cartilage, but excludes tendons, muscle and fat tissue (Fisher *et al*., 1994). Weight of meat and bones is recorded in separate troughs for each carcass.

Weight of edible and non-edible offal's and weight of skin (organ weights)

The weight of edible (liver, heart, testes, diaphragm, kidneys and spleen) and non-edible organs (blood, skin, lungs, trachea, stomach and intestines) were recorded.

RESULTS AND DISCUSSION

The data recorded during the experiment was tabulated, statistically analysed, interpreted and discussed here under.

Fortnightly body weight and total weight gain

The data on effect of different floor types on fortnightly body weight gain and total weight gain in Nellore brown ram lambs is presented in Table 1. Statistical analysis of

Table 1: Body weight (kg) of Nellore brown ram lambs kept on different floor types

Treatment Floor Type	Initial Body Weights (kg)	Fortnightly Body Weight# (Mean ± SE, kg)								Total Weight Gain (kg)
		1	2	3	4	5	6	7	8 (Final Body Weight)	
T1	15.69 ± 0.51	17.40 ± 0.36	17.48 ± 0.12	16.91 ± 0.30	18.34 ± 0.78	18.90 ± 0.29^{c}	19.79 ± 0.86^{b}	21.85 ± 1.14^{b}	22.19 ± 1.16^{b}	6.51 ± 1.13^{b}
T2	15.31 ± 0.32	17.22 ± 0.32	17.64 ± 0.14	16.97 ± 0.40	18.67 ± 0.35	19.93 ± 0.27^{b}	21.45 ± 0.37^{b}	23.29 ± 0.82^{b}	24.28 ± 0.76^{b}	8.97 ± 0.76^{b}
T3	15.34 ± 0.33	17.08 ± 0.25	17.51 ± 0.21	17.27 ± 0.15	19.42 ± 0.57	21.58 ± 0.28^{a}	24.05 ± 0.94^{a}	26.20 ± 0.78^{a}	28.29 ± 1.32^{a}	12.95 ± 1.30^{a}
N	08	08	08	08	08	08	08	08	08	08
SEM	0.22	0.17	0.09	0.17	0.33	0.28	0.56	0.63	0.81	0.82
P VALUE	0.756	0.760	0.776	0.663	0.413	0.001	0.003	0.010	0.003	0.002

^{abc}Means in columns with different superscripts differ significantly (P<0.01); #Each value is an average of eight observations; **T1** : Conventional mud (Gravel) floor; **T2** : Concrete floor; **T3** : Elevated plastic slatted floor; **N** : No. of animals in each treatment; **SEM** : Standard Error Mean; **P-Value** : Probability Value

the data showed significantly higher (P<0.01) body weight in T3 and T2 groups in the fifth fortnight and significantly (P<0.01) higher body weight in T3 group from sixth to eighth fortnight compared with other two treatments. The data also showed significantly (P<0.01) higher total weight gain in the lambs kept on elevated plastic slatted floor (T3 group) compared with other two groups. These results are in accordance with the findings of several workers (Sundaram *et al*. (2002); Bhakat and Nagpaul (2011); Yasotha and Sivakumar (2013); Divate (2014); Ramachandran *et al*. (2017) and Deshmukh (2017)), who reported the body weight was significant among the different floor types. The results obtained in present study might be due to comparatively better feed utilisation, hygienic surroundings and good animal comfort in elevated plastic slatted floor. In mud and concrete floors, it was noticed that the lambs enter the feed mangers and water troughs frequently, there by spoiling the quality of feed and water by defecation and urination and these problems were not noticed in T3 group. In contrary to the results of the present study, several researchers like, Kulkarni *et al.* (2000), Di Grigoli *et al*. (2003), Patil *et al.* (2008), Thiruvenkadan *et al*. (2009), Jaborek *et al.* (2016), Chikwanda and Muchenje (2017), Mohit *et al*. (2019a), Modi *et al*. (2019), Patel *et al*. (2020), Ramachandran *et al.* (2020) and Tharun tej *et al*. (2020) have reported the difference in body weight of lambs was non-significant among different floor types.

Average daily gain

The data on fortnightly average daily gain (ADG) obtained in lambs kept on different floor types are presented in Table 2. Statistical analysis of the data revealed that, there was no significant difference for ADG among three treatment groups in different fortnights. However, comparatively higher average daily again of T3 group lambs observed than T2 and T1 groups from fourth to eighth fortnights. Similar findings were observed by Kulkarni *et al.* (2000), Chikwanda and Muchenje (2017), Ramachandran *et al.* (2017), Mohit *et al*. (2019a), Patel *et al.* (2020), Ramachandran *et al.* (2020) and Tharun tej *et al.* (2020). The present findings were not in agreement with Sundaram *et al*. (2002) and Yasotha and Sivakumar (2013) and Divate (2014) who reported that, there was a significant difference (P<0.05) in ADG among different floors.

Feed intake and dry matter intake

The data on effect of different floor types on feed and dry matter intake in Nellore ram lambs are presented in Table 3. Perusal of the data revealed that, there was a better feed utilisation in the lambs on elevated plastic slatted floor compared to lambs on mud and concrete floors, but statistically feed and dry matter intake were similar among lambs reared on mud, concrete and elevated plastic slatted floors. Similar findings were reported by Mohit *et al*. (2019a) and Tharun Tej *et al*. (2020) in lambs when kept on different floors. In contrary, Di Grigoli *et al*. (2003), Kumari *et al.* (2013), Rahman *et al.* (2013), Divate (2014), Izeldin *et al*. (2014), Chikwanda and Muchenje (2017), Ramachandran *et al*. (2017) and Modi *et al*. (2020)

Table 2: Average daily gain (g) of Nellore brown ram lambs kept on different floor types

Treatment Floor	Fortnightly Average Daily Gain[#] (Mean ± SE, g)							
Type	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
T1	114.38 ± 29.40	5.05 ± 28.57	-38.10 ± 24.38	95.24 ± 35.55	37.60 ± 45.62	59.52 ± 49.59	137.14 ± 70.94	18.05[NS] ± 24.92
T2	127.50 ± 29.79	27.92 ± 21.10	-44.75 ± 27.27	113.50 ± 13.36	83.75 ± 24.42	101.67 ± 32.57	122.50 ± 44.90	51.97[NS] ± 47.24
T3	115.58 ± 19.74	29.17 ± 9.75	-16.25 ± 10.70	143.33 ± 30.55	143.75 ± 24.64	165.00 ± 54.24	143.33 ± 25.34	109.87[NS] ± 34.88
N	08	08	08	08	08	08	08	08
SEM	14.65	11.53	12.30	15.67	19.75	27.04	26.75	22.31
P VALUE	0.928	0.664	0.624	0.475	0.088	0.295	0.951	0.249

[#]Each value is an average of eight observations; [NS]Non-significant; **T1** : Conventional mud (Gravel) floor; **T2** : Concrete floor; **T3** : Elevated plastic slatted floor; **N** : No. of animals in each treatment; **SEM** : Standard Error Mean; **P-Value** : Probability Value.

Table 3: Feed intake and dry matter intake (g) of Ram lambs kept on different floor types

Treatment Floor Type	Feed Intake (kg/day)	DMI (kg/day)
	(Mean ± SE)	
T1	1.50 ± 0.24^{NS}	0.65 ± 0.05^{NS}
T2	1.77 ± 0.13^{NS}	0.67 ± 0.05^{NS}
T3	2.01 ± 0.14^{NS}	0.73 ± 0.05^{NS}
N	08	08
SEM	0.11	0.03
P Value	0.162	0.440

^{NS}Non-significant; **T1**: Conventional mud (Gravel) floor; **T2**: Concrete floor; **T3**: Elevated plastic slatted floor; **N**: No. of animals in each treatment; **SEM**: Standard Error Mean; **P-Value**: Probability Value.

Table 4: Carcass traits of ram lambs kept on different floor types

Treatment Floor Type	Carcass traits$^{\#}$ (Mean ± SE)						
	Live Weight of Animals (kg)	Hot Carcass Weight (kg)	Dressing Percentage	Meat to Bone Ratio	Edible Offal's Weight (kg)	Non-edible Offal's Weight (kg)	Weight of Skin (kg)
T1	27.85 ± 2.90	12.52 ± 0.94	45.08 ± 1.34	1.65 ± 0.08	1.04 ± 0.14	3.94 ± 0.76	3.27 ± 0.51
T2	30.15 ± 2.70	14.15 ± 1.16	46.98 ± 0.38	1.73 ± 0.05	1.15 ± 0.07	3.73 ± 0.07	3.34 ± 0.43
T3	32.58 ± 0.33	15.18 ± 0.03	46.59 ± 0.39	1.78 ± 0.16	1.22 ± 0.13	3.64 ± 0.12	3.72 ± 0.01
N	02	02	02	02	02	02	02
SEM	1.34	0.62	0.52	0.05	0.06	0.21	0.19
P value	0.449	0.361	0.234	0.697	0.609	0.894	0.693

$^{\#}$Each value is an average of two observations; ^{NS}Non-significant; **T1**: Conventional mud (Gravel) floor; **T2**: Concrete floor; **T3**: Elevated plastic slatted floor; **N**: No. of animals in each treatment; **SEM**: Standard Error Mean; **P-Value**: Probability Value.

reported significant increase in feed and dry matter intake under different types of floors.

Carcass Traits

The data on effect of different floor types on live weight, hot carcass weight, dressing percentage, meat to bone ratio, edible offal's weight, non-edible offal's weight and weight of the skin are presented in Table 4. The statistical analysis of the data revealed a non-significant difference in live weight, hot carcass weight, dressing percentage, meat : bone ratio, edible offal's weight, non-edible offal's weight and skin weight among three floor types. Similar findings were observed by Teixeira *et al.* (2015), Jaborek *et al.* (2016) and Tharun Tej *et al.* (2020) who reported that there was no significant effect of floor type on carcass characteristics.

CONCLUSION

It can be concluded that the overall body weight gain was significantly higher in lambs reared on elevated plastic slatted floor when compared to mud and concrete floors. The feed intake and dry matter intake of growing stall fed Nellore ram lambs were similar among the three treatment groups. There was a non- significant difference in live weight, hot carcass weight, dressing percentage and meat to bone ratio, edible offal's weight, non-edible offal's weight and skin weight among three different floor types. Though statistically not significant, the higher ADG and DMI in lambs reared on elevated slatted floor resulted in better returns, hence recommended for farmers adoption.

ACKNOWLEDGEMENTS

The authors are thankful to the P.V. Narsimha Rao

Telangana Veterinary University, Hyderabad, India for according permission along with necessary financial support to carry out the research work.

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