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Effect of flooring material on body weight and biometry of sahiwal calves

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Abstract

A study was carried out to assess the effect of different flooring material on the body weight and biometry of the Sahiwal calves. Eighteen Sahiwal calves of either sex with average body weight of 110.41 ± 7.62 kg and aged between 6 to 8 months were assigned randomly to three flooring types viz., Concrete floor (control, T1), Concrete bedded with straw floor (T2) and Concrete floor with rubber mats (black, rubber material, 8 mm thick (T3). The study was conducted from May 2018 to August 2018. Significant ($P < 0.05$) difference was observed for the fortnightly body weights and average daily gain of the calves among three treatment groups. The average daily gain was comparable among the treatment groups. The overall fortnightly biometric measurements like body length, chest girth, the height at withers, poll length and Tail length of sahiwal calves increased linearly throughout the experimental period and showed non-significant ($P > 0.05$) difference among the groups except for chest girth. It is concluded that among the flooring materials, rubber mats relatively improved the body weight and biometry of the sahiwal calves.

Keywords: body weight, biometry, sahiwal calves, flooring material

Introduction

As per the 20th livestock census (2019) the cattle population in India is 192.49 million and contributes 35.94 % of total livestock population. India ranks first in world cattle population. Telangana state is known for its diversified livestock resources. Sahiwal breed is recognized as one of the best milch breeds in the tropics (Ilatsia *et al.*, 2011) [1]. It is famous for its resistance to internal and external parasite and highest potential for adequate milk production under subsistence production.

Profitability of any dairy enterprise depends on proper replacement of older and un-productive cows. Calves raised on own farms forms an effective and reliable replacements and this depends on efficient calf management. Unfortunately one of the most neglected aspects of dairy management in India is calf management as a result of which the mortality rate in calves is very high. The rearing and management methods used during the pre-weaning period of a dairy calf's life is more important to reduce stress and to minimize the risk of disease (Panivivat *et al.* 2004; Sutherland *et al.* 2014) [2, 3]. Calves are more susceptible to temperature fluctuations (both hot and cold) and require provision of some form of shelter or shade (Panivivat *et al.* 2004; Rushen *et al.* 2007) [2, 4]. Flooring is one of the most important components of animal housing as far as animal health, growth and welfare are concerned. An ideal housing enables in moderating the range of microclimate to which the animals are exposed and the wellbeing varies upon the forms of housing and floor in which they are kept. Therefore, the present study was carried out to assess the body weight and biometry of sahiwal calves on the different flooring materials.

Materials and Methods

The experiment was conducted out in Dairy Animal Experimentation unit of Livestock Farm Complex, College of Veterinary Science, Rajendranagar, Hyderabad. Hyderabad city lies at 17.366° N latitude and 78.476° E longitude in the Deccan Plateau and rises to an average height of 536 m above the sea level. The climate of the Hyderabad is unique which has a combination of a tropical wet and dry climate that borders on a hot semi-arid climate.

Eighteen sahiwal calves of either sex with average body weight of 110.41 ± 7.62 kg and aged between 6 to 8 months were selected from Dairy Experimental station unit of LFC and randomly allotted to three flooring types viz., Concrete floor (control, T1), Concrete bedded with straw floor (T2) and Concrete floor with rubber mats (black, rubber material, 8 mm thick

(T3). All the calves in the experiment were housed under conventional housing provided with a floor space of 1.4m² / calf in the covered shed with an asbestos roof. Calves in the experiment were fed as per the standard calf feeding schedule followed at Dairy experimental station. Provision of chopped jowar straw in the morning 8 AM and green fodder (para grass) (ad-libitum) in the evening 3 PM. The study was conducted from May to August 2018 (120 days). All animals were dewormed with Albendazole @ 10 mg /kg body weight before start of the experiment and allowed a seven days acclimatization on the same flooring materials before start of the experiment.

Body measurements indicate the skeletal growth of the animals. Body length and height at withers are the measures of bone growth while chest girth is measure of development of muscles, bones and fat (Ramod *et al.*, 2018) [20]. Body weight of calves were recorded at fortnightly intervals using a digital electronic weighing balance before offering feed and water in the morning. Average daily gain was calculated by dividing the weight gain to the number of the experiment days. Biometric measurements like body length, chest girth, height at withers, poll length and tail length were recorded with the help of a standard measuring tape to the nearest 0.5 centimetre after the animals were allowed to stand squarely on an even ground. Body length (cm) is measured from point of shoulder to the point of tuber ischia of the same side; Chest girth (cm) is measured as distance of body circumference around the chest, ventrally behind the elbow joint; Height at withers (cm) distance between point of ground surface to the

highest point of withers, poll length (distance between the poll region of forehead), tail length (distance between base of the tail to tip of the tail). The data were subjected to analysis of variance by Duncan's multiple range test (Duncan, 1955) [5] using SPSS statistical software (version 15.0; SPSS)

Results and Discussion

Body Weight of Calves on Different Flooring Material

Effect of flooring materials on fortnightly recorded body weight, weight gain and ADG is presented in Table 1. The overall mean for body weight (kg) of Sahiwal calves was 129.83 ± 5.15, 143.88 ± 5.26 and 145.85 ± 4.61 on T1, T2 and T3 groups, respectively. The initial body weights(kg) of calves was 110.41±7.62, 119.00±7.31 and 115.16±12.12 and which was increased to 151.16±10.69, 166.00±7.67 and 168.50±18.06 kg, respectively in T1, T2 and T3 by eighth fortnight. The body weight of calves increased as they are in growing stage. Statistical analysis of the data showed significant difference among three treatment groups. The average daily gain was (grams) 374.48±3.84, 390.71±2.94 and 420.64±6.60 in T1, T2 and T3 groups, respectively. The average daily gain was higher in calves reared on rubber mat than calves reared on concrete floor. This could be due to that the rubber mat floor provided the maximum comfort to calves and more time to lie down on the floor compared to the concrete floor. An increased resting time may result in better quality sleep that leads to an altered growth hormone secretion and improved growth.

Table 1: Effect of flooring materials on fortnightly recorded body weight (kg) and ADG (g)

Period	T1	T2	T3
Initial	110.41 ± 7.62	119.00 ± 7.31	115.16 ± 12.12
Fortnight 1	113.50±9.66	127.78±6.93	132.50±13.27
Fortnight 2	118.66±10.13	133.33±7.33	140.41±13.24
Fortnight 3	121.50±10.22	136.75±7.05	145.50±14.56
Fortnight 4	124.66±9.75	139.50±7.03	147.58±14.52
Fortnight 5	131.33±10.29	147.25±5.94	152.33±15.52
Fortnight 6	137.25±10.79	157.25±6.26	163.00±18.41
Fortnight 7	143.33±10.72	161.66±6.68	165.50±18.23
Final fortnight (8)	154.50±10.69	166.00±7.67	166.24±18.06
ADG (grams)	374.48±3.84	390.71±2.94	420.64±6.60
Overall mean +S.E	129.83 ^a ± 5.15	143.88 ^b ± 5.26	145.85 ^b ± 4.61

*a, b means with different superscripts differ significantly ($P < 0.05$) (P value .047)

The results of the present study are in concurrence with the findings of Deshmukh (2017), Divate (2014), Cozzi *et al.* (2013), Graunke *et al.* (2011) [17, 18, 6, 7] who reported that there was significant difference in the body weight and average daily gain due to different flooring systems in different species pertaining to rubber mat floor, similarly the results of Hill *et al.* (2011), Di Grigoli *et al.* (2003) Smith and Daamen (1992), Seidmann (1990), Markovie *et al.* (1974) [8, 9, 10, 11, 12] are in accordance with the results of present study with respect to straw bedded floor. Sundaram *et al.* (2002) and Yasotha and Sivakumar (2013) [21, 22] reported that there was a significant difference ($P < 0.05$) in ADG among the different floors. Kartal and Yanar (2011) [13] and Yanar *et al.* (2010) [14] reported a significant weight gain in calves maintained on rubber mats. The average daily gain (ADG) of Sahiwal calves was 374.48±3.84, 390.71±2.94 and 420.64±6.60 g in T1, T2 and T3 groups, respectively. The recorded ADG was comparable among the three treatment groups.

Biometric measurements on Different Flooring Material

Body Length

The overall mean of body length of calves reared on T1, T2 and T3 groups was 83.38±2.50, 86.64±2.31 and 89.61±2.60cm respectively. The initial body length was 70.66 ± 1.68, 74.66±2.81 and 76.16±3.50 cm in T1, T2 and T3 floors, respectively and was increased to 92.83 ± 2.12, 95.50±1.85 and 99.83±1.70 cm in eight fortnight in concrete, concrete plus straw and rubber mat floors, respectively. Body length of Sahiwal calves has increased linearly throughout the experiment period and statistical analysis revealed a non-significant difference among three treatment groups (Table 2) except the chest girth. Rubber mat floor was comfortable to exhibit physiological functions of calves and stretching of their body parts, like head, neck and legs while standing, resting and lying time. The difference in body length was found insignificant ($P > 0.05$) and this indicate that the concrete floor provides less comfort to the calves which may

be affected its growth and other body measurements. Similar findings were recorded by Rashid *et al* (2016) [15] who reported that age had significant influence ($P<0.001$) on all body measurements. These results were also supported by the results of Sahana *et al* (2001) [16], whereas inconsistent with Yanar (2010) and Kartal and Yanar (2011) [14, 13].

Table 2: Effect of flooring material on body length (cm) in sahiwal calves

Period	T1	T2	T3
Initial	70.66±1.68	74.66±2.81	76.16±3.50
Fortnight 1	73.66±1.76	77.66±2.48	79.66±3.41
Fortnight 2	76.66±1.82	81.41±2.87	82.83±3.19
Fortnight 3	79.50±2.10	82.83±3.38	86.33±3.15
Fortnight 4	84.50±2.21	86.66±2.88	90.16±2.05
Fortnight 5	85.50±1.76	88.66±2.98	91.66±1.83
Fortnight 6	87.50±1.45	90.66±1.91	93.33±1.85
Fortnight 7	90.16±1.30	92.8±1.44	96.33±1.56
Final fortnight (8)	92.83±2.12	95.50±1.85	99.83±1.70
Overall mean +S.E	83.38±2.50	86.64±2.31	89.61±2.60

Chest Girth

The circumference of chest girth of the animals is an important indicator of animal health, body weight and size which helps in respiration. The overall mean of chest girth was 116.28±1.75, 123.05± 2.07, 125.00 ±2.48 in concrete, concrete plus straw and rubber mat floors, respectively. The initial mean chest girth was 105.83±3.66, 110.33±4.58 and

110.50±32.02 cm in T1, T2 and T3 groups, respectively and was increased to 121.83±2.53, 129.83±3.84 and 133.50± 2.32 cm in eighth fortnight in T1, T2 and T3 groups, respectively. The chest girth was similar among the treatment groups. The observed overall mean for chest girth (cm) was numerically higher in the T2 and T3 groups (Table 3). This could be due to more weight gain along with the bony growth in the calves reared on T2 and T3 groups compared to the T1 group. These results were also supported by the results of Rashid *et al* (2016) [15], Sahana *et al* (2001) [16], whereas inconsistent with Yanar (2010) and Kartal and Yanar (2011) [14, 13].

Height at withers

The overall mean of height at withers (HAW) was 103.76 ±1.68, 107.11±1.95 and 107.66±2.17 cm in T1, T2 and T3 groups, respectively. No significant difference ($P>0.05$) was observed in height at withers among the calves reared in three different floors. The findings indicated that the mean fortnightly height at withers of Sahiwal calves increased linearly throughout the experiment period. Height at withers was numerically higher in Sahiwal calves maintained on rubber mat floor and lower in concrete and concrete plus straw flooring (Table 4). This could be due to more weight gain along with bony growth in the calves reared on rubber mat floor and it reflects the rubber mat floor was comfortable. Similar results were reported by Rashid *et al* (2016) [15], Sahana *et al* (2001) [16], whereas inconsistent with Yanar (2010) and Kartal and Yanar (2011) [14, 13].

Table 3: Effect of flooring material on chest girth (cm) in sahiwal calves

Period	T1	T2	T3
Initial	105.83±3.66	110.33±4.58	110.50±2.02
Fortnight 1	109.00±3.68	114.50±4.50	114.58±1.82
Fortnight 2	112.66±3.55	119.00±4.47	119.83±2.57
Fortnight 3	115.33±3.25	123.16±4.37	123.33±2.47
Fortnight 4	117.66±3.15	123.83±4.40	126.33±2.99
Fortnight 5	117.66±2.81	125.00±4.05	128.33±2.98
Fortnight 6	120.16±2.74	126.50±4.31	129.66±2.32
Fortnight 7	120.83±2.91	128.50±4.25	130.50±2.15
Final fortnight (8)	121.83±2.53	129.83±3.84	133.50±2.32
Overall mean +S.E	116.28 ^a ±1.75	123.05 ^b ± 2.07	125.00 ^b ±2.48

*a, b means with different superscripts vary significantly ($P<0.05$) (P value 0.019)

Table 4: Effect of flooring material on height at withers (cm) in sahiwal calves

Period	T1	T2	T3
Initial	94.66±1.86	96.16±1.92	95.33±1.49
Fortnight 1	97.50±2.08	99.83±1.85	99.33±2.57
Fortnight 2	100.16±1.66	104.16±1.60	103.83±2.70
Fortnight 3	102.00±1.89	104.60±1.73	105.00±2.28
Fortnight 4	103.16±1.94	106.00±2.10	107.60±2.30
Fortnight 5	105.00±2.10	107.66±1.75	109.33±2.09
Fortnight 6	106.10±1.77	110.80±2.00	111.10±2.38
Fortnight 7	108.00±1.35	112.83±2.20	113.30±2.55
Final fortnight (8)	110.50±0.95	114.50±1.96	115.80±2.40
Overall mean +S.E	103.76±1.68	107.11±1.95	107.66±2.17

Poll length

The overall mean of poll length was 14.04 ±0.39, 14.45±0.3.8 and 15.00±0.45 cm in T1, T2 and T3 groups, respectively. No significant difference ($P>0.05$) was observed in poll length among the calves reared in three different floors. The findings indicated that the mean fortnightly poll length of Sahiwal calves increased linearly throughout the experiment period. Poll length was numerically higher in Sahiwal calves maintained on rubber mat floor and lower in concrete and

concrete plus straw flooring (Table 5). This could be due to more bony growth in the calves reared on rubber mat floor and it reflects the rubber mat floor was comfortable. Similar results were reported by Tsado *et al* (2009) reported that castrates of savannah brown goats manifested higher values in poll distance than non-castrates. Rashid *et al* (2016) [15], Sahana *et al* (2001) [16], whereas inconsistent with Yanar (2010) and Kartal and Yanar (2011) [14, 13].

Table 5: Effect of flooring material on poll length (cm) in sahiwal calves

Period	T1	T2	T3
Initial	12.16±0.35	12.41±0.24	12.83±0.40
Fortnight 1	12.58±0.34	13.00±0.27	13.16±0.40
Fortnight 2	12.83±0.35	13.41±0.27	13.58±0.37
Fortnight 3	13.41±0.39	14.08±0.27	14.41±0.41
Fortnight 4	14.00±0.28	14.25±0.25	15.08±0.35
Fortnight 5	14.33±0.27	14.83±0.24	15.58±0.32
Fortnight 6	14.66±0.24	15.33±0.21	15.83±0.33
Fortnight 7	15.25±0.27	15.66±0.25	16.16±0.35
Final fortnight (8)	15.58±0.28	15.75±0.37	16.66±0.35
Overall mean +S.E	14.04±0.39	14.45±0.38	15.00±0.45

Tail length

The overall mean of tail length was 55.80 ±2.18, 58.10±0.81 and 58.16±1.24 cm in T1, T2 and T3 groups, respectively. No significant difference ($P>0.05$) was observed in tail length among the calves reared in three different floors which was supported by Rashid *et al* (2016) [15]. Tail length was numerically higher in Sahiwal calves maintained on rubber mat floor and lower in concrete and concrete plus straw flooring (Table 6). This could be due to growth of body parts

like head, neck and tail in the calves reared on rubber mat floor and it reflects the rubber mat floor was comfortable. Similar results were reported by Paul *et al.* (2011) reported that at 3 and 6 months of age the average tail length of Black Bengal goats was 7.42±0.24 and 8.69±0.27 cm respectively, which might be due to breed difference. There is a positive correlation between the body weight and tail length of goats stated by Awuah *et al.* (2000); Otoikhian *et al.* (2008) and Tudu *et al.* (2015).

Table 6: Effect of flooring material on tail length (cm) in sahiwal calves

Period	T1	T2	T3
Initial	45.00±1.36	48.00±1.21	51.83±1.19
Fortnight 1	48.16±1.72	50.83±1.92	53.16±1.24
Fortnight 2	49.16±1.67	54.00±1.95	54.66±1.58
Fortnight 3	52.00±1.37	55.83±1.48	56.50±1.76
Fortnight 4	55.16±0.95	58.33±1.55	58.66±1.30
Fortnight 5	58.00±0.98	60.16±1.03	59.83±1.01
Fortnight 6	61.00±0.84	62.66±1.00	60.33±1.05
Fortnight 7	62.83±0.80	63.50±0.74	61.33±0.98
Final fortnight (8)	63.33±0.90	63.83±0.61	62.66±0.66
Overall mean +S.E	55.80±2.18	58.10±0.81	58.16±1.24

Conclusion

The body weight, ADG and biometric measurements were similar among the different flooring materials. However, the overall performance of the Sahiwal calves was relatively superior on the rubber mat floors compared to the other floors. Further studies are required for more understanding of flooring materials.

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