



Influence of floor type on production performance and worm load in lactating Jakhrana goats

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In the recent years, the status of goats is shifting from poor man's cow to preferred livestock species and the traditional goat rearing is steadily turning as the fast growing livestock industry in the country. Similarly, the focus of rearing goats for milk is gaining momentum along with meat. The milk production vary with breed, age, stage of lactation, feeding level and management practices under different production systems (Shinde *et al.* 2004, Singh and Ramachandran 2007, Singh *et al.* 2009). Though the factors that mainly influence milk production in goats, the environment condition with which animals are reared greatly influences milk quantity and quality. During the extreme weather conditions, the modification of micro-climate through shelter interventions increases milk yield in livestock (Patel *et al.* 2001, 2007). Among shelter structures, type of floor and roof play a major role in providing comfortable micro-climate, welfare and better shed hygiene for clean milk production in dairy animals (Rahman *et al.* 2013). Yogendran (2012) suggested that although the high tech ruminant sheds are considerably more expensive than traditional sheds used, the extra cost can quickly be recovered from the improved quality and higher milk yields. The provision of raised floor, alternate roof in goat shelters on feed intake, growth performance, welfare and worm load in goats have been reported (Bhakat and Nagpaul 2005, Kumari *et al.* 2013, Ramachandran *et al.* 2017, Singh *et al.* 2017, Ramachandran and Singh, 2017). Singh *et al.* (2017) reported that the coccidial infection in goats of semi-arid region is very high and may turn out to be pathogenic to the goats. However, the information on provision of such shelter intervention on milk production performance and worm load of goats is lacking. Therefore, the present study aimed to assess the provision of raised

floor in loose housed goat pens on production performance of lactating Jakhrana goats, which is one of the best milch breeds of north-western India.

The study was conducted at Makhdoom which falls under semi-arid region of India. The mean maximum, minimum, daily temperature, dry and wet bulb temperature, relative humidity, vapor pressure, total rainfall, total sunshine and THI during experimental period (Nov-Feb) were 26.93, 10.10, 18.52, 20.93, 15.95°C, 62.82%, 11.53 mmHg, 17.60 mm, 782.40 h and 67.29, respectively.

Sixteen pregnant Jakhrana goats (42.41±1.76 kg) were selected considering for parity and previous lactation milk yield 3 weeks before expected date of kidding (-21 d prepartum: -21 PrP) for adaptation for the experimental conditions. The goats were randomly divided into 2 equal groups of 8 each and assigned to pen having either wooden slatted floor (SLF) or soil floor (SOF) in goat shelters. Slatted/raised floor (15'×20' size) was constructed at height of 3.75 feet from ground using Mirandi wooden slats of 2" width and 1" thick, having 1.5 cm space between the slats (Ramachandran *et al.* 2014). The goats of each group were reared separately in enclosures with the floor area of 30 m² under *ad lib.* feeding and uniform management conditions up to 120 days postpartum (120 d PoP). Goats were offered *ad lib.* roughage (gram straw-*Cicer arietinum*, Arhar straw-*Cajanus cajan*), concentrate pellets and green fodder (cow pea-*Vigna sinensis*, berseem-*Trifolium alexandrinum*), and drinking water was available for 24 h. The experimental protocol was approved by the Institute Animal Ethics Committee. The concentrate pellets contained maize grain 15, rice broken 15, barley grain 14, mustard cake 5, guar korma 5, deoiled rice bran 20, wheat bran 15, molasses 7, mineral mixture 2 and salt 1 part. The OM, CP, EE, NDF, ADF content of concentrate on dry matter basis was 92.39, 15.92, 2.87, 28.13, 8.92%. The respective values for green fodder and dry fodder were 87.33, 22.34, 2.60, 49.65, 35.56% and 89.29, 7.69, 1.70, 57.82, 45.94%.

The test day milk yield was recorded at weekly interval up to 120 d PoP at 8.00 AM and 3.30 PM for all the animals and milk yield was calculated for 30, 60, 90 and 120 days of lactation. Live weight was recorded at fortnightly

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intervals using electronic weighing scale (Digicontrols Northern Pvt. Ltd., Noida, India) to monitor body weight trend of goats during the trial. Faecal samples from all the goats were collected at -21 PrP and at 120d PoP to assess worm load. Faecal eggs/oocysts counts were carried out on freshly collected faecal samples using centrifugal floatation in saturated salt (NaCl) solution and modified McMaster technique, which were expressed as eggs/oocysts per gram (EPG/OPG) of faeces.

The pair-wise comparison of milk yield on slatted and soil floor during different days of lactation (30, 60, 90 and 120 days) was done by independent sample t-test. The mixed model procedure with covariance structure (diagonal) followed by Bonferroni correction was used for analysis of weekly milk yield, fortnightly body weight changes. Treatment (floor type; SLF or SOF) and weeks (time) were considered as fixed factor, time as repeated effects, and their respective interactions were included in the model. The data on faecal egg/oocyst counts were analyzed and presented as geometric means (GFEC) (Yadav *et al.* 2006). The GFEC data were subjected to GLM procedure of SPSS to find out significant difference between 2 floors, 3 parasitic types and 2 sampling periods. All statistical analyses were performed using SPSS (version 16.0, SPSS Inc., Chicago, IL). Data are presented as arithmetic means±SEM, significance, variations were assessed by probability value (P) with the following levels of significance: P <0.05, P <0.01, P <0.001 and a trend was noted when 0.05≤P ≤0.10.

The mean milk yield (Table 1) of goats on slatted floor was lower than the goats on conventional soil floor. The milk yield of goats on slatted floor was significantly lower (P<0.045) as compared to milk yield of goats on soil floor up to 30 days of lactation. The goats on slatted floor also showed lower trend of milk production up to 60 days and

up to 90 days postpartum. However, the milk yield up to 120 days was statistically similar on both floors in the present study. The results obtained on lactation performance in this study were in agreement with the previous finding in dairy goats (Singh *et al.* 2009). However, milk yield in the current study was also lower (Shinde *et al.* 2004, Mirzaei *et al.* 2011) and higher (Upadhyay *et al.* 2013) than the milk yield reported earlier in different breeds of goats reared under varied system of rearing.

The overall weekly mean milk yield of goats on slatted and soil floors were recorded to be 1.114±0.12 and 1.358±0.12 L/goat/day, respectively. The analysis of data indicated that the milk production of goats on slatted floor was significantly lower (P<0.001) than goats reared on conventional soil floor. The lower milk yield in slatted floor in the present study could possibly due to comparatively higher chillness to lactating goats through perforated slats during peak winter in the present study. Singh and Ramachandran (2007) recorded 0.627 l/goat/day in Sirohi goats reared under intensive rearing system. Rahman *et al.* (2013) reported higher milk yield in lactating Alpine × Beetal crossbred goats reared on elevated wooden floor with thatched roof as compared to pen having concrete floor with concrete roof (1.47±0.07 vs 1.37±0.05) during summer.

The mean body weight of goats on slatted and conventional soil floor 2 weeks before kidding was 43.71±3.42 and 41.11±1.11 kgs, respectively. The respective body weight immediately after kidding were 37.75±2.62 and 38.12±1.70 kg with a body weight loss of 13.64 and 7.28% in slatted and soil floor. The body weight of goats on slatted floor was significantly higher (P=0.009) than that of goats on soil floor throughout the trial. This could be due to the less mobilisation of body reserve for milk production as reflected in lower milk yield in slatted floor goats. The body weight loss was higher up to second fortnight postpartum (first month of lactation) in goats maintained on both floors, though the loss was of higher magnitude in goats on slatted floor. From third fortnight postpartum onwards, the higher weight loss in goats maintained on soil floor could be correlated with higher milk yield of goats on soil floor (Table 3). The loss of body weight after kidding could be due to expulsion of kids, amniotic fluids, placenta, and reduced intake one day prior to kidding. The similar body weight loss of 4–6 kg in dairy goats (Sahlu 1995) and dairy ewes (Hernández *et al.* 2018) was also reported after kidding and lambing, respectively.

The coccidial oocysts (eggs per gram) in terms of

Table 1. Mean milk yield (l) of Jakhrana goats on different floors

Floor type	Milk yield (l)			
	Up to 30 days of lactation	Up to 60 days of lactation	Up to 90 days of lactation	Up to 120 days of lactation
Slatted floor	29.26±3.16	59.11±6.37	86.03±8.86	115.71±11.99
Soil floor	37.42±1.65	73.66±1.75	105.07±1.27	138.24±3.59
P Value	0.045	0.052	0.059	0.854

Table 2. Weekly trend of test day milk yield of goats on different floors

Floor type	Weeks postpartum														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Slatted floor	1.366±0.10	0.998±0.17	1.258±0.21	1.103±0.19	1.130±0.24	1.244±0.22	1.105±0.21	0.998±0.14	1.044±0.19	0.967±0.17	1.019±0.16	1.202±0.18	1.118±0.15	1.085±0.11	1.073±0.10
Soil floor	1.507±0.11	1.429±0.16	1.556±0.04	1.381±0.08	1.451±0.02	1.295±0.04	1.452±0.08	1.371±0.09	1.309±0.12	1.278±0.11	1.062±0.15	1.377±0.08	1.163±0.10	1.383±0.09	1.361±0.05

Floor type, P=0.001; Weeks, P=0.363; Floor type × Weeks, P=0.961.

Table 3. Fortnightly trend of body weight loss (%) of goats on different floors

Floor type	Body weight loss (%) during and after kidding at fortnightly intervals								
	0	1	2	3	4	5	6	7	8
Slatted floor	-13.64	-22.14	-16.55	-18.27	-13.83	-15.88	-15.01	-11.02	-12.68
Soil floor	-7.28	-18.13	-18.65	-19.79	-15.82	-18.49	-17.58	-13.57	-15.39

geometric faecal egg count (GFEC) in goats reared on slatted floor during first and second sampling was lower than goats on soil floor, though statistically nonsignificant (Table 4). However, the oocysts at 120 d PoP was significantly lower ($P<0.001$) than at -21 d PrP, irrespective of the floors which corroborates our previous findings on growing kids (Ramachandran *et al.* 2017, Singh *et al.* 2017). The lower coccidial oocysts at 120 d PoP in SLF goats as compared to SOF goats in this study could be due to the absence of picking up of infection from the soil. The tapeworms and roundworms were similar in goats reared on both floors in the present study. The lower bursate worm

(nematode eggs) and coccidial oocysts after first sampling could be owing to the deworming and anticoccidial treatment in December-January during the trial period.

Our findings suggested that the provision of slatted floor in goat shelters in semi-arid areas may not be beneficial in increasing production of lactating goats during winter, however, it can help in maintaining lower worm load in animals. This warrants further studies in goat shelters having raised slatted floor with higher winter protection measures for rearing lactating goats.

SUMMARY

The aim of this study was to investigate the effect of slatted floor (SLF) over soil floor (SOF) on performance of lactating goats reared under group feeding conditions up to 120 days postpartum. Fortnightly live weight and weekly test day milk yield was recorded and milk yield was calculated for 30, 60, 90 and 120 days postpartum. Worm load of goats were assessed. Milk yield was significantly lower at 30 days, showed lower trend at 60 days and at 90 days postpartum in SLF than SOF. The overall milk yield in SLF and SOF were 1.114 ± 0.12 and 1.358 ± 0.12 l/goat/day, respectively. The coccidial oocysts in SLF goats were non-significantly lower, tapeworms and roundworms were similar than that of SOF goats.

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Table 4. Mean±SD for logarithmic faecal oocyst/egg count* (LFOC/LFEC) {loge (FOC or FEC+100)} of Jakhrana goats under slatted vs soil floor at 2 sampling periods

Type of parasitic oocysts/eggs	Sampling periods	Slatted floor	Soil floor	Overall floor
Coccidia	-21d PrP	4.71±0.04 (2300)	4.73±0.07 (2733)	4.72±0.06 (2517)
	120d PoP	4.63±0.03 (433)	4.65±0.04 (1033)	4.64±0.03 (733)
	Mean	4.67±0.05 (1367)	4.69±0.07 (1883)	4.68±0.06 (1625)
Tape worms	-21d PrP	4.63±0.03 (467)	4.63±0.03 (500)	4.63±0.03 (483)
	120d PP	4.61±0.00 (0)	4.61±0.00 (0)	4.65±0.01 (0)
	Mean	4.63±0.03 (233)	4.62±0.02 (250)	4.62±0.02 (242)
Bursate	-21d PrP	4.65±0.04 (1000)	4.65±0.04 (1033)	4.65±0.04 (1017)
	120d PP	4.61±0.00 (0)	4.62±0.01 (300)	4.62±0.01 (150)
	Mean	4.63±0.04 (500)	4.64±0.03 (667)	4.63±0.03 (583)
Overall	-21d PrP	4.66±0.05 (1256)	4.67±0.06 (1422)	4.67±0.06 (1339)
	120d PP	4.62±0.01 (144)	4.63±0.03 (444)	4.62±0.02 (294)
	Mean	4.64±0.04 (700)	4.65±0.05 (933)	4.64±0.05 (817)

*Units eggs/g; -21d PrP, first sampling at three weeks before expected date of kidding; 120d PoP, second sampling at 120 days postpartum. Value in parenthesis indicates the geometric faecal oocyst/egg count (GFOC/GFEC). P value: floor ($P=0.162$); sampling periods ($P<0.001$); type of parasitic oocysts/eggs ($P<0.001$); floor × type ($P=0.450$); floor × stage ($P=0.687$); type × sampling periods ($P=0.009$); floor × sampling periods × type of parasitic oocysts/eggs ($P<0.931$).

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