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Effect of disinfected floor on growth performance of Assam Hill Goat

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Abstract

The aims of the study were to determine how floor cleaning affected Assam Hill Goat (AHG) performance. Weaned kids who were three months old were distributed into three groups at random. The first group was raised on a floor devoid of disinfectant (T₁), the second group was raised on a floor disinfected with sodium hypochlorite, or bleach (T₂), and the third group was raised on a floor disinfected with calcium oxide, or quicklime (T₃). At three months, kids in the T₁, T₂, and T₃ groups weighed an average of 6.01 ± 0.16 kg, 6.23 ± 0.16 kg, and 6.21 ± 0.17 kg, respectively. At six months, the equivalent body weight was 10.45 ± 0.17 kg, 11.93 ± 0.23 kg, and 11.38 ± 0.22 kg, respectively. Children in the T₁, T₂, and T₃ groups gained an average of 0.076 ± 0.007 kg, 0.100 ± 0.006 kg, and 0.091 ± 0.006 kg in body weight per day throughout the sixth fortnight (5.5 to 6 months of age). While the T₃ group weren't different substantially from the T₁ group, the average body weight gain in the T₂ group was significantly ($P < 0.01$) greater than that of the T₁ group. In addition to having fewer instances of diarrhoea and parasite infection, T₂ had significantly improved feed DMI and feed conversion ratio (FCR).

Keywords: Goat, disinfection, body weight, dry matter, feed conversion ratio, health status

1. Introduction

The livestock contributes about 40 and 20 percent of total agricultural output in developed and developing countries, respectively and supplies 34 percent global food protein, supporting the livelihood of 1.3 billion people worldwide (FAO, 2018) [9]. The goat is a promising livestock to maintain livelihood and uplifting the socio-economic status of poor people of developing countries. It is also regarded as "Poor man's cow". India has the largest goat population in the world, with 148.88 million, according to the 20th livestock census. Central Institute for Research on Goats (CIRG) projected goats as 'Future animal' for rural and urban prosperity. Besides meat and milk, the goat provides other products like skin, fiber and manure. Goat consumes less feed (about 1/5th of cattle) and needs minimum space (1/6th of cattle) for housing. Goats have exceptional tolerance to heat stress and it can control weeds to grow on poor quality feed (Norman, 1991) [12]. The people of Assam are mostly non-vegetarian and as a result, the demand for meat and meat products in the state is considerably high. The goat population in Assam is 4.32 million (20th livestock census) showing a decline of about 30 percent than the previous census. Farmers generally prefer the intensive system of farming so that balanced feed can be provided to the animals for better growth. But an unhygienic intensive system of housing may lead to infectious diseases. Prevention and control of infectious disease in animals mainly rely on the maintenance of a healthy environment through hygiene, which includes effective cleaning and

disinfection. Lamani *et al.* (2020) [11] reported that parasitic diseases in goats can spread through contaminated pasture, soil, feed, and water, with higher exposure occurring under certain rearing systems due to accumulation and transmission of infective parasite stages. Parasitic load in Mandya sheep varied with the rearing system, mainly due to exposure to contaminated pasture, soil, feed and water; continuous grazing and poor sanitation increased contact with infective parasite stages and thereby enhanced the risk of parasitic infection (Sudharshan *et al.*, 2016) [16]. The main aim of disinfection is to interrupt the route of transmission of germs between the source and healthy subjects and the selection of a disinfectant is mainly based on its cost, availability and efficiency.

Materials and Methods

The current study was conducted at the Goat Research Station, Assam Agricultural University, Burnihat, Assam, over a three-month period (February to April, 2022). At three months of age, eighteen healthy Assam Hill Goats (AHG) of comparable size—nine male and nine female—were selected. The male and female kids were randomized separately and put in three groups *viz.* T₁ - kids reared on untreated floor, T₂ - the floor was sprayed fig.1 (a) with 0.5% sodium hypochlorite (NaClO) which was prepared by mixing 100 ml of 5% commercially available hypochlorite solution in 900 ml of water and T₃-floor dusted fig. 1 (b) with calcium oxide (CaO) *i.e.* quicklime uniformly. The kids were housed in the shed having elevated (4ft.) slatted

floor and half wall (3 ft.) for open natural ventilation facility during the entire experimental period. Each individual kids were separated within the pens. The kids were vaccinated as per the farm schedule and deworming was done before the commencement of the experiment. The floor of the shed was cleaned thoroughly every day in all the groups. Disinfection of floor with above mentioned disinfectants was done in T₂ and T₃ groups at weekly interval during entire period of experiment. The kids under trial were offered concentrate ration (CP-19.90% & TDN-74.65%) @ 2 percent of body weight and farm-grown roughage viz. Para grass (*Bracharia mutica*), Guinea grass (*Megathyrsus maximus*), Napier grass (*Pennisetum purpureum*) mixed in

equal portion to offer *ad-libitum* twice daily. The feed residues if any were collected in the next morning before feeding and weighed to know the actual consumption. However, the daily feed offered was adjusted so as to minimize wastage on account of residual leftovers. The records of voluntary feed intake and its leftover or residue were recorded daily to estimate dry matter intake (DMI). Wholesome fresh drinking water was made available on regular basis.

Every two weeks, the kid's body weight was measured using a spring balance. The following formula was used to determine the body weight gain:

$$\text{Fortnightly body weight gain} = \left\{ \begin{array}{c} \text{Body weight at the} \\ \text{end of the fortnight} \end{array} \right\} - \left\{ \begin{array}{c} \text{Body weight at the} \\ \text{beginning of the fortnight} \end{array} \right\}$$

$$\text{Average daily increase in body weight} = \frac{(\text{Final body weight} - \text{Initial body weight})}{\text{No. of days}}$$

Dry matter intake (DMI), which was used to measure feed consumption, was divided by body weight growth to determine the daily DMI. The following formula was then

used to get the feed conversion ratio (FCR) (Sapra and Shingari, 1991)^[14]:

$$\text{Feed conversion ratio (FCR)} = \frac{\text{Total dry matter Intake (DMI) in kg during the fortnight}}{\text{Body weight gain in the fortnight}}$$



(a)



(b)

Fig 1: (a) Application of sodium hypochlorite (spraying) and (b) Calcium Oxide (dusting)

Statistical analysis

The experimental data was subjected to one-way ANOVA as per the standard method Snedecor and Cochran 1994)^[15] with the help of IBM SPSS 20.0 version.

Results

Assam Hill Goats' average body weight at various ages has been provided in the [Table 1]. At six months of age, kids categorised in the T₁, T₂, and T₃ groups weighed an average of 10.45 ± 0.17 kg, 11.93 ± 0.23 kg, and 11.38 ± 0.22 kg, respectively. The groups' body weights in the fifth and sixth months varied significantly (*P* < 0.05). Between the ages of five and six months, the T₂ group's body weight

gain was noticeably greater. [Table 2]. The FCR was found to be significantly lower in the T₂ group compared to the T₁ and T₃ groups [Table 4], and the average daily dry matter intake (DMI) was similarly significantly greater in the T₂ group [Table 3]. Throughout the course of three to six months, the incidence of diarrhoea was five, two, and four in the T₁, T₂, and T₃ groups, respectively. Diarrhoea did not occur at all in the T₂ group starting in the third two weeks of the trial also negligible quantity of parasite present in fecal fig.2.

The parasitic ova were found to be highest in T₁ group (71.8%), intermediate in T₃ (58%) and lowest in T₂ (46.8%).

Table 1: Assam Hill Goats' Average (mean ± se) Body Weights

Age (months)	Body weight (kg)			P-value
	T ₁	T ₂	T ₃	
3	6.01 ± 0.16	6.23 ± 0.16	6.21 ± 0.17	>0.05
4	7.00 ± 0.18	7.43 ± 0.19	7.36 ± 0.21	>0.05
5	8.41 ± 0.21 ^a	9.21 ± 0.17 ^b	8.96 ± 0.19 ^{ab}	0.033*
6	10.45 ± 0.17 ^a	11.93 ± 0.23 ^b	11.38 ± 0.22 ^{ab}	0.011*

There was a significant difference ($P < 0.05$) between means with various superscripts within a row.

Table 2: Average (mean $\pm$ se) Body Weight Gain in Assam Hill Goats

Period (months)	Fortnightly body weight gain (kg)			P value
	T ₁	T ₂	T ₃	
3-4	0.56 $\pm$ 0.09 (0.038 $\pm$ 0.007)	0.70 $\pm$ 0.09 (0.046 $\pm$ 0.006)	0.67 $\pm$ 0.10 (0.044 $\pm$ 0.007)	>0.05
4-5	0.82 $\pm$ 0.07 (0.056 $\pm$ 0.004)	1.03 $\pm$ 0.13 (0.070 $\pm$ 0.009)	0.93 $\pm$ 0.10 (0.062 $\pm$ 0.006)	>0.05
5-6	1.14 $\pm$ 0.11 ^a (0.076 $\pm$ 0.007 ^a)	1.54 $\pm$ 0.10 ^b (0.100 $\pm$ 0.006 ^b)	1.37 $\pm$ 0.10 ^{ab} (0.091 $\pm$ 0.006 ^{ab})	0.049*

Daily body weight rise is indicated by the figures in following. There was a significant difference ($P < 0.05$) amongst means with various superscripts within a row.

Table 3: Average (mean $\pm$ se) DMI of Assam Hill Goats

Period (months)	DMI (kg)			P value
	T ₁	T ₂	T ₃	
3-4	4.24 $\pm$ 0.11 (0.283 $\pm$ 0.0073)	4.98 $\pm$ 0.12 (0.352 $\pm$ 0.0071)	4.75 $\pm$ 0.13 (0.317 $\pm$ 0.0090)	>0.05
4-5	5.48 $\pm$ 0.14 ^a (0.365 $\pm$ 0.0093)	6.04 $\pm$ 0.11 ^b (0.403 $\pm$ 0.0074)	5.81 $\pm$ 0.13 ^{ab} (0.387 $\pm$ 0.0086)	0.031*
5-6	6.59 $\pm$ 0.10 ^a (0.439 $\pm$ 0.0007)	7.51 $\pm$ 0.17 ^b (0.501 $\pm$ 0.0110)	7.34 $\pm$ 0.16 ^{ab} (0.489 $\pm$ 0.0107)	0.023*

The daily dry matter consumption (kg) is shown by the figures in following. There was a significant difference ($P < 0.05$) between means with various superscripts within a row.

Table 4: Average (mean $\pm$ se) FCR in Assam Hill Goats

Period (months)	Feed conversion ratio			P-value
	T ₁	T ₂	T ₃	
3-4	7.40 $\pm$ 0.20	6.98 $\pm$ 0.12	7.10 $\pm$ 0.15	0.211
4-5	6.64 $\pm$ 0.12 ^a	5.85 $\pm$ 0.10 ^b	6.32 $\pm$ 0.11 ^a	0.001**
5-6	5.80 $\pm$ 0.12 ^a	4.88 $\pm$ 0.10 ^b	5.36 $\pm$ 0.11 ^c	0.001**

The graphical representation of overall Assam Hill Goats' average body weight, BODY WEIGHT GAIN, Dry Matter Intake (DMI), Feed Conversion Ratio (FCR) shown in fig 3.

Discussion

Body weight

At six months of age, the goats in the T₁, T₂, and T₃ groups weighed an average of 10.45 $\pm$ 0.17 kg, 11.93 $\pm$ 0.23 kg, and 11.38 $\pm$ 0.22 kg, respectively (Table 1). The body weight at 4th, 5th and 6th fortnight differed significantly ($P < 0.05$) due to use of disinfectant. The body weight in T₂ group was significantly higher than the T₁ group. In AHG under field conditions, the average body weight at 6 months was greater than 8.03 kg (Das *et al.*, 2022) [6] and 8.48 kg (Doley *et al.*, 2023) [8], whereas in AHG under intensive system of care, it was nearly 10.360.26 kg (Hoque *et al.*, 2021) [10].

The current study's higher body weight compared to earlier workers may be the result of better management. However, the average body weight of Mehsana children was greater at around six months (13.56 to 13.87 kg) (Patel *et al.*, 2020) [13], which may have been caused by the breed's genetic makeup. Under intensive and semi-intensive systems, the average body weight of Salem goats was 13.51 $\pm$ 0.46 kg and 13.53 $\pm$ 0.44 kg, respectively (Chinnamani *et al.*, 2018) [13].

In the T₁, T₂, and T₃ groups, the average fortnightly body weight gain at the sixth fortnight, approximately 5.5 to 6 months of age, was 1.14 $\pm$ 0.11, 1.51 $\pm$ 0.10, and 1.37 $\pm$ 0.10 kg, respectively (Table 2). As each of the three groups grew older, their body weight growth rose. In Barbari goats (Antil *et al.*, 2019) [2], the average daily weight gain was between 73.10 and 76.13 g, whereas in Mehsana goats (Patel *et al.*, 2020) [13], it was between 34.08 $\pm$ 2.24 and 39.23 $\pm$ 4.10 g.

Compared to the T₁ group, the T₂ group's average body weight gain was considerably ($P < 0.05$) greater. The treatment groups' improved cleanliness and hygiene may be the cause of the notable body weight difference. As a floor disinfectant, sodium hypochlorite was reasonably effective at lowering the microbial load (Divyalaxmi *et al.*, 2020) [7].

Dry matter intake (DMI)

In terms of dry matter, children in T₁ groups consumed an average of 4.05 $\pm$ 0.11 kg (0.270 $\pm$ 0.0072 kg/day) of feed each fortnight in the first fortnight, which progressively climbed to 6.59 $\pm$ 0.10 kg (0.439 $\pm$ 0.0007 kg/day) in the sixth fortnight (Table 3). According to Das *et al.* (2022) [6], the corresponding values were 4.48 $\pm$ 0.120 (0.299 $\pm$ 0.0080 kg) and 7.51 $\pm$ 0.174 kg (0.501 $\pm$ 0.0110 kg) for T₂ and 4.37 $\pm$ 0.117 (0.291 $\pm$ 0.0080 kg) and 7.34 $\pm$ 0.163 kg (0.489 $\pm$ 0.0107 kg) for T₃. found that crossbred Beetal x Assam Local goats had an average daily DMI of 0.40 $\pm$ 0.02 kg between 4 and 7.0 months. Mehsana goats on earthen (kuccha) floors had an average daily DMI of 325.40 $\pm$ 9.3 g/14.

In the current investigation, DMI increased as age increased. The fourth, fifth, and sixth fortnights showed a notable variation in DMI. Compared to the control group T₁, the DMI in the T₂ group differed considerably ($P < 0.05$). But there was not a significant distinction between the T₃ group and the control. The children in the T₂ group may have better health and appetite due to the hygienic conditions created by applying sodium hypochlorite on the floor.

When compared to concrete and earthen (kuccha) flooring,

female goats (Beetal x Alpine) housed on dry, clean slatted floors had a higher daily DMI ($0.452 \text{ kg feed} + 0.302 \text{ kg concentrate}$) (Bhakat and Nagpaul, 2005) [3]. In the current study, the T_2 group had a significantly ($P < 0.05$) higher average daily DMI (0.501 ± 0.0110). It can be deduced that sanitary flooring often have a reduced microbial load, which raises DMI.

Feed conversion ratio (FCR)

During the first two weeks, the average FCR of the healthy kids in the T_1 , T_2 , and T_3 groups was 7.80 ± 0.18 , 7.38 ± 0.17 , and 7.65 ± 0.18 , respectively. In the sixth fortnight, the T_1 , T_2 , and T_3 groups' results were 5.80 ± 0.12 , 4.88 ± 0.10 , and 5.36 ± 0.11 , respectively. As the age of the three groups increased, the FCR improved. The T_2 group's mean value was found to be lower than that of the T_1 and T_3 groups, suggesting that using a floor treated with sodium hypochlorite produced superior performance than the other groups. There was a highly significant difference ($P < 0.01$) in the FCR between the three groups during the fourth fortnight. The FCR of the T_2 group was considerably higher than that of the T_1 and T_3 groups, according to the critical difference test. In terms of numbers, the T_3 group's FCR in the fourth fortnight was superior to that of the T_1 group. Over the fifth and sixth cycles, there was a significant ($P <$

0.01) difference in the FCR across the groups. Compared to the current study, Beetal crossbred goats showed higher FCR (8.00 ± 1.64) at 4.0-4.5 months of age and lower FCR (5.48 ± 1.06) during 6.5-7.0 months of age (Das *et al.*, 2022) [6]. Higher FCR (9.95 ± 0.70) was also observed in Mehsana goats from 3 to 6 months of age (Patel *et al.*, 2020) [13]. The incorporation of sodium hypochlorite to maintain better cleanliness and hygiene in the pen may have contributed to the T_2 group's decreased FCR in the current study and improved growth performance.

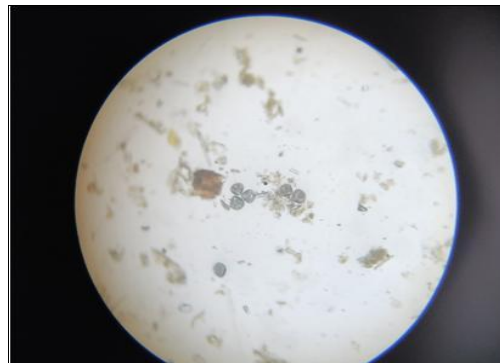


Fig 2: Faecal Sample Positive for Negligible Parasitic Ova

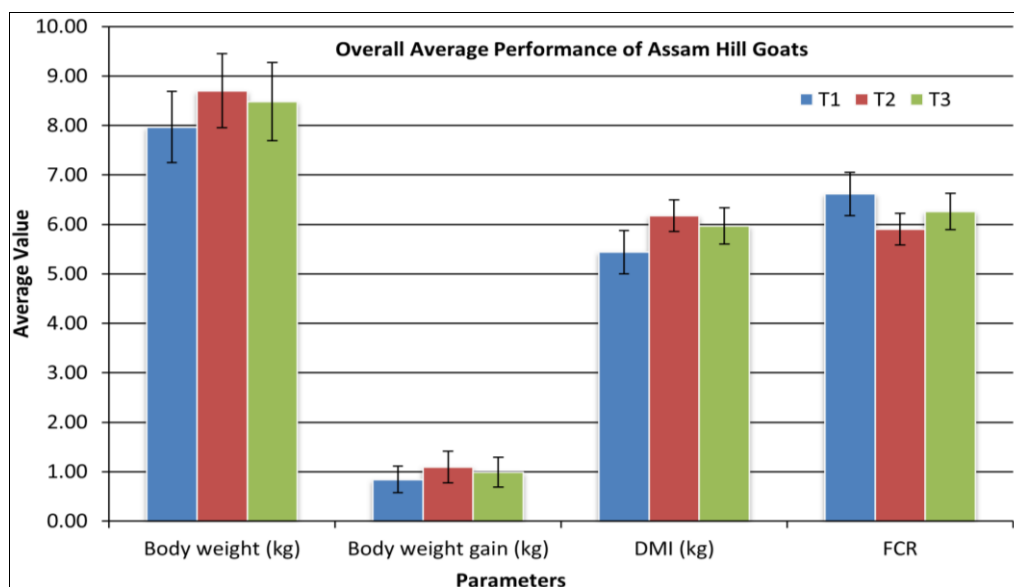


Fig 3: Graphical representation of Overall Average Performance of Assam Hill Goats

Conclusion

The current study shown that the performance of Assam Hill Goats in terms of body weight and FCR can be enhanced by using a disinfectant on the floor at least once a week. When compared to the untreated control group, the disinfectant-treated floor groups had a lower incidence of parasitic infestation and diarrhoea. When used as a disinfectant on the goat shed floor, sodium hypochlorite (bleach) outperformed calcium oxide (quick lime).

- **Application of research:** The research article suggests improvement of housing management of kids by application of disinfectant on the floor.
- **Research Category:** Shelter management of small ruminant.
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- **Author statement:** All authors read, reviewed, agreed and approved the final manuscript.
- **Place of study:** Department of LPM, CVSc, AAU, Khanapara, Guwahati, 781022, India and GRS, AAU, Burnihat
- **Breed name:** Assam Hill Goat (AHG)

Conflict of Interest: None

Ethical approval: Approved by Institutional Animal Ethics Committee

Contribution in Research: SD: conducted the whole experiment, JH; AH: Continuously guided for whole research, VD; AD; KCB: Helped in animals care and management, SM: helped in writing the article.

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