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Research Article

EFFECT OF DIFFERENT FLOOR SPACE ALLOWANCES ON FEED, WATER AND NUTRIENT INTAKE OF ADULT SURTI GOAT UNDER INTENSIVE HOUSING SYSTEM

SHEIKH N.A.[1]*, ISLAM M.M.[2], MODI R.J.[1] AND WADHWANI K.N.[3]

[1]Department of Livestock Production and Management, Veterinary College, Kamdhenu University, Gandhinagar, 382010, Gujarat, India
[2]Pashupalan Sanshodhan Kendra, Ramna Muvada, V.D.U., Anand Agricultural University, Anand, 388110, Gujarat, India
[3]Livestock Research Station, V.D.U., Anand Agricultural University, Anand, 388110, Gujarat, India
*Corresponding Author: Email - nurjaha9567@gmail.com

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Abstract: The present study was conducted to compare the effect of different floor space allowances on feed, nutrient and water intake of adult Surti goat under intensive housing system during winter season. Forty-five adult dry non pregnant (25-30kg) farm born Surti goats were divided randomly on the basis of body weight into three treatment groups *i.e.*, T_1:1.5m^2/head, T_2:1.25m^2/head and T_3:1m^2/head floor space allowances. Each treatments group comprised of three replication and each having 4(T_1), 5(T_2) and 6(T_3) animals per group. The experimental animals were maintained on ICAR feeding standard (2013) and Total Mixed Ration (TMR) was offered to the animals. The measured quantity of wholesome clean water was offered twice daily. The goats reared on T_1 (775.10±12.77 and 2.25±0.05) consumed significantly (P<0.05) more DM (g/d and % body weight) as compared to animals reared on T_2 (496.56±9.98 & 1.44±0.05) and T_3 (473.79±14.15 & 1.35±0.07), respectively. However, DMI (g/KgW0.75) consumption was significantly (P<0.05) higher in T_1 (55.17±1.39) followed by T_2 (37.06±1.35) and T_3 (32.42+1.28) groups. Intake of DCP (g/d, % body weight and g/Kg W0.75) was significantly higher in T_1 (60.23±1.05, 0.17± 0.04 and 4.28±0.12) followed by T_2 (40.34±0.82, 0.11±0.04 and 2.98±0.12) and T_3 (35.22±1.06, 0.10±0.04 and 2.40±0.08) groups, respectively. The goats reared on T_1 (465.53±7.90 and 1.32±0.03) consumed significantly (P<0.05) more TDN (g/d and % body weight) as compared to animals reared on T_2 (295.66±6.18 and 0.88±0.02) and T_3 (274.59+8.31 and 0.80±0.03), respectively.

Keywords: *Floor space allowances, Feed, Nutrient, Surti goat, Intensive housing system*

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Introduction

Goat (*Capra hircus*) was the earliest ruminant domesticated around 9000 to 7000 B.C. India possesses the largest goat population (148.88 million) which rank second in the world and contributes about 27.80% of the total livestock population of India [1]. Goat is the most popular domestic species among India's small and marginal farmers for their livelihood as they are well adapted to all types of environmental severities and exhibit superior performance among the other domesticated ruminants. Goat plays a significant economic role for the farming communities living in lowland, midland and highland provinces.

Space allowance is defined as the average area given per animal [2,3]. Because of its economic importance, it is regarded as a distinguishing characteristic of all animal production systems. Space impediment can have negative results on welfare and performance of animals. It has been observed that space restrictions are related with increased behavioral problems, aggression and reduction of the performance in animals [4,5]. An increase in space allowance, the most of the performance parameters such as body weight gain (BWG), average daily gain (ADG), feed conversion ratio (FCR) increase and the performance parameters are better in large space allowance [6,7].

Materials and Methods

The study was conducted on 45 adult dry non pregnant (25-30 Kg) farm born Surti goats of Livestock Farm Complex (LFC), College of Veterinary Science and Animal Husbandry, Anand. The experimental goats were kept in full monitored well ventilated asbestos roof house constructed east to west direction having Kachcha, Pacca and brick types of floors. The animals were housed on each floor in three replications.

The height of roof in the shed at center and at eve was 14 and 9 ft., respectively. The dimension of each pen was 8.5 x 8.0 ft. in covered and 11 x 8.0 ft. in uncovered area and equipped with pucca manger and water trough. The experimental goats were distributed randomly on body weight basis in three treatment groups *i.e.*, T_1: 1.5 m^2 (4 Animals in each pen), T_2: 1.25m^2 (5 Animals in each pen) and T_3: 1 m^2 (6 Animals in each pen) floor space Allowances. Each treatment comprised of three replications and each replication had equal number of animals *i.e.*, 4, 5 and 6. The present experiment was conducted in winter season for six-weeks duration (12th Jan to 24th Feb). The adaptation period of 15 days was given prior to start of experiment in each season.

The experimental goats were fed ad lib Total Mixed Ration (TMR). The TMR was offered twice daily at 9.00 A.M. and 3.00 P.M. The mineral mixture containing vitamin was added in prescribed dose to meet adequate Vitamin A. The experimental goats were offered ad lib wholesome clean water daily in group in plastic tub. The experimental goats were monitored for parasitic infestation at regular interval. The increased or decreased in quantity of TMR and water offered to experimental goats depended upon left over on next day morning. The TMR was prepared by maintaining roughages concentrate ratio (65:35) and mineral mixture contained Vitamin A was added in prescribed dose to meet adequate Vitamin A [Table-1].

The measured quantity of wholesome clean water was offered daily in morning to experimental animals in groups in plastic buckets. The water was offered twice daily to fulfill the requirement of goats. Leftover quantity offered and water was weighed every morning. Daily feed and water intake records were maintained throughout the experimental period.

Proximate principles of TMR were estimated as per the methods of AOAC, (2012) [8]. Data on feed and nutrient intake were analyzed using completely random design (factorial) as per Snedecor and Cochran (1991) [9]. On dry matter (DM) basis, the chemical composition of TMR revealed 13.00% Crude protein and 22.13% crude fibre [Table-2].

Table-1 *Composition of total mixed ration*

SN	Name of the ingredients	Percentage (%)
1	Jowar hay	65.00
2	Amul Dan	34.00
3	Mineral mixture	1.00
4	Vitamin AD3 supplement	60gm/100kg
	Total	100%

Table-2 *Proximate analysis of TMR*

SN	Content	% (DM basis)
1	Dry matter	89.00
2	Crude protein	13.00
3	Ether extract	2.13
4	Crude fibre	22.13
5	Nitrogen free extract	42.63
6	Ash	8.61

Results and Discussion

The DMI (g/d) consumption reduced significantly (P<0.05) when goats were provided 1.00 and 1.25 m^2 floor space to the tune of 35.94 and 38.87%, respectively as compared to goats received 1.5 m^2 floor space where as dry matter intake was at par in goats received either 1.25 or 1.00 m^2 floor space. The DMI (b.wt.%) in experimental goats was the highest when maintained on 1.5 m^2 floor space as compared to goats maintained on 1.25 and 1.00m^2 floor space. The dry matter intake (g/kg w0.75) in experimental goats was the highest when maintained under 1.5 m^2 as compared to goats maintained on 1.25 m^2 and 1.00 m^2. The DCP intake (g/d) in Surti goats reared on different floor space allowances showed significant (P<0.05) difference. The Surti goats reared on 1.5 m^2 floor space consumed significantly (P<0.05) more DCP than goats reared on 1.25 and 1.00 m^2 floor space allowances. The DCP intake (b.wt.%) in Surti goats reared on different floor space allowances showed significant (P< 0.05) difference in DCP intake (g/d) among all treatment groups. The Surti goats reared on 1.5 m^2 floor space consumed significantly (P< 0.05) more DCP than goats reared on 1.25 and 1.00 m^2 floor space allowances. The DCP intake (g/kgw0.75) in Surti goats reared on different floor space allowances showed significant (P< 0.05) difference in DCP intake (g/d) among all treatment groups. The Surti goats reared on 1.5 m^2 floor space consumed significantly (P<0.05) more DCP than goats reared on 1.25 and 1.00 m^2 floor space allowances [Table-3].

Table-3 *Feed, nutrients and water intake of experimental animals*

Intake	Floor space allowances		
	T_1 (1.5m^2/head)	T_2 (1.25m^2/head)	T_3(1.0m^2/head)
Dry mater intake			
g/d	775.10^b ±12.77	496.56^a±9.98	473.79^a±14.15
Body wt.%	2.25^b±0.05	1.44^a±0.05	1.35^a±0.07
g/Kg $W^{0.75}$	55.17^e±1.39	37.06^b±1.35	32.42^a+1.28
Digestible Crude protein			
g/d	60.23^c ±1.05	40.34^b ±0.82	35.22^a ±1.06
Body wt.%	0.17^c ± 0.04	0.11^b ±0.04	0.10^a ±0.04
g/Kg $W^{0.75}$	4.28^c ±0.12	2.98^b ±0.12	2.40^a±0.08
Total digestible nutrients intake			
g/d	465.53^b±7.90	295.66^a±6.18	274.59^a+8.31
Body wt.%	1.32^b±0.03	0.88^a±0.02	0.80^a±0.03
g/Kg $W^{0.75}$	33.13^c±0.85	21.70^b±0.7	18.75^a±0.60
Water intake			
l/d	2.52^c ±0.04	2.35^b±0.04	2.23^a±0.04
Body wt.%	6.70^b±0.09	6.30^a±0.11	6.08^a±0.12
l/Kg $W^{0.75}$	0.16^b±0.002	0.15^a±0.003	0.15^a+0.003
l/Kg DMI	4.66^b±0.14	4.52^b±0.33	3.72^a±0.10

The TDN intake (g/d) in experimental goats was the highest when maintained on 1.5 m^2 floor space as compared to goats maintained on 1.25 and 1.00 m^2 floor space. The TDN intake (b.wt.%) in experimental goats was the highest when maintained on 1.5 m^2 floor space as compared to goats maintained on 1.25 and 1.00 m^2 floor space. The TDN intake (g/kg W 0.75) in Surti goats reared on different floor space allowances showed significant (P<0.05) difference in TDN intake among all treatment groups. The Surti goats reared on 1.5 m^2 floor space consumed significantly (P<0.05) more TDN than goats reared on 1.25 and 1.00 m^2 floor space allowances.

The total feed intake was higher in T_1 as compared to T_2 and T_3 which indicate that space allowance showed significant (P≤0.05) effect on average daily weight gain at fortnightly intervals. Similar results were obtained by Mellado *et al*., (2003) [10] and Panda *et al*., (2016) [11]. However, Zhang *et al*., (2009) [12] and Vas *et al*., (2013) [13] reported that space allowance had no significant impact on average daily weight gain. The results obtained in present study is in the line with the findings of Panda *et al*., (2016) who revealed that large space allowance increased body weight gain of Osmanabadi goats at weekly intervals. Increased feed conversion efficiency could have resulted in a higher average daily gain weight in large space allowances.

The water intake (l/d) in Surti goats reared on different floor space allowances showed significant (P<0.05) difference among all treatment groups. The Surti goats reared on 1.5 m^2 floor space consumed significantly (P<0.05) more water than goats reared on 1.25 and 1.00 m^2 floor space allowances. The water intake (l/kg DMI) in Surti goats reared on different floor space allowances showed significant (P<0.05) difference among all treatment groups. The Surti goats reared on 1.5 m^2 floor space consumed significantly (P<0.05) more water than goats reared on 1.25 and 1.00 m^2 floor space allowances. The water intake (b.wt. %) of Surti goats reared on different floor space allowances showed significant (P<0.05) difference among all treatment groups. The Surti goats reared on 1.5 m^2 floor space consumed significantly (P<0.05) more water than goats reared on 1.25 and 1.00m^2 floor space allowances. The water intake (l/kg W 0.75) of experimental goats was significantly (P<0.05) higher when maintained on 1.5m^2 floor space as compared to goats maintained on 1.25m^2 and 1m^2 floor space allowance [Table-3].

The water intake (l/d) observed by Modi (2019) [14] on Kachcha floor (2.37±0.09) supported the present findings but the values observed by him on brick (1.93±0.05) and pucca (2.10±0.05) were very low which differed with the present findings. Similarly, Malhar (2020) [17] observed very high values of water intake (l/d) as compared to present finding which contraindicated with the present findings. The water intake (l/Kg DMI) well supported the present findings by Ravikala (1992) [18] whereas Choudhary (1988) [19] and Sahana (2019) [20] observed either higher or lower values and contraindicated with the present findings. The water intake (b.wt.%) in present findings is contraindicated with Choudhary (1988); Ravikala (1992), Modi (2019), Patel (2019) [21] and Malhar (2020) who observed either higher or lower values of water intake. This may be due to heavy body weight goats selected during present experiment. However, Wadhwani (1999) [22] supported the present findings. The water intake (l/kg W0.75) in the present findings is well supported by the findings of Patel (2019) and Modi (2019) whereas Wadhwani (1999) and Malhar (2020) observed higher values of water intake which contraindicated with the present findings.

Conclusion

It may be concluded from the present study that different floor space allowances have significant impact on feed, nutrient and water intake in Surti Goats.

Application of research:

Research Category: Livestock Production and Management

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****Principal Investigator or Chairperson of research: Dr N A Sheikh**
University: Kamdhenu University, Gandhinagar, 382010, Gujarat, India
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Study area / Sample Collection: Livestock Farm Complex (LFC), College of Veterinary Science and Animal Husbandry, Anand

Breed name: *Capra hircus* - Surti goat

Conflict of Interest: None declared

Ethical approval: This article does not contain any studies with human participants or animals performed by any of the authors.
Ethical Committee Approval Number: Nil

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