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Effect of Floor Space Allowance Under Katcha Housing on Growth Performance of Post-Weaning Osmanabadi Kids in Mumbai

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ABSTRACT

This experiment was conducted to find out the effect of different floor space allowance on the growth performance of Osmanabadi kids. Eighteen Osmanabadi kids between the age group of 3-4 months and body weight of 7-8 kg were randomly selected irrespective of sex. The selected kids were divided and kept into three different groups with different floor space comprising of 6 kids in each group. GroupT_0 (0.8m^2 floor space/kid), Group T_1 (0.7m^2/kid) and Group T_2 (0.6m^2/kid). The feeding and other management practices for all the three groups were similar. The body weight of kids at 3 and 6 months of age was 6.75, 6.86, 6.82 and 12.69, 12.44, 11.98 kg respectively in Group T_0, T_1 and T_2. The average daily gain and average weekly gain in body weight were 70.77 ± 1.62, 66.05 ± 1.80, 61.50 ± 3.95 gm/day and 495.39 ± 11.39, 465.26 ± 11.00, 430.00 ± 14.64 gm/wk in Group T_0, T_1 and T_2 respectively. There was significant effect of floor space on average daily gain ($P<0.01$), average weekly gain ($P<0.01$) and also on average monthly gain ($P<0.05$) of Osmanabadi kids. It was concluded that provision of floor space is positively correlated with the growth performance of kids

Keywords: Floor space, growth performance, katcha housing, Osmanabadi kids

Goat *(Capra hircus*) was the earliest ruminant domesticated around 9000 to 7000 B.C. India possesses the largest goat population (135.17 million) which rank second in the world and contributes about 26.54% of the total livestock population of India (19th livestock census, 2012). Amongst the goat breeds of India, Osmanabadi goat breed is a native of Marathwada region of Maharashtra, but it is reared, bred and well adapted throughout India. In housing management, particularly floor management is an important aspect of goat husbandry, which provides both comfort and cleanliness with minimal risk of injury. It is also well known fact that floor space plays limitations which have negative consequences on the welfare and production of animals, as well as on performance. The floor space requirement for the weaned kids (3-6 months old) as per BIS (Bureau of Indian Standard, 1985) is 0.8m^2. Space is generally defined as the average area offered per animal and it is considered a defining feature of all animal production systems due to its economic implications (Petherick and Phillips, 2009). Provision of large enclosures for animal housing implies larger land requirements, higher construction and maintenance costs, and possibly manpower requirements. Therefore, commercial animal production systems usually limit, to some degree floor space. The total goat population in India in urban areas is 6,092 thousand and in rural areas is 1,29,081 thousand (19th Livestock Census, 2012). There is an abrupt decrease by 16.66% in goat rearing compared to 2007 mostly in urban areas due to increased human population and lack of land availability. Providing adequate space in rural area is no problem but there are limitations while rearing goats in providing adequate space in urban areas. In today's date the cost of land is at highest price in urban areas. To reduce the cost of land it is essential to reduce the total area/space provided without hampering the welfare and performance of goats. The performance of the animal is also influenced by environmental factors like temperature and humidity in region. Rearing the goats in these climatic conditions

in complete confinement with reduced floor space is difficult for the goat farmers. Therefore, to overcome this situation, studying the growth performance of goats on different floor space area is an important aspect. In view of the constraints in rearing of goats in urban area due to unavailability of adequate space and high cost of land, the present research work was planned.

MATERIALS AND METHODS

The research was carried out in the Instructional Livestock Farm Complex of Bombay Veterinary College at Maharashtra Animal and Fishery Sciences University, India.

Selection of experimental animals

Total 18 healthy Osmanabadi kids of either sex between the age group of 3-4 months (after weaning) were selected randomly from the same herd of the farm. Selection was based on the physical appearance and to some extent the mortality record data from the respective dams. So the size of the kids that were taken for the experiment was of nearly same. The average body weight of the kids was between 6-7 kg. They were identified with ear tagging with individual identity number. Before entering to the herd of the experiment, they had undergone for deworming and vaccination.

About Katcha Housing System

As far as the tropical country like India is concerned, thatched type of roof is preferred in terms of housing. The roof was of single slope type and the height at the ridge was 3.2 m. In this katcha system of housing, the floor was made up of mud and normal soil. There was no artificial layering over the floor. The wall is built with bamboo and other wood type material. Ventilation as one of the important aspect of housing was also facilitated in this housing system. The wall, 1 m height from the floor was entirely made up of bamboo and the rest of the part was designed with the wire net. So the above attempt was a showcase for the wise provision of ventilation. The katcha housing system was being prioritized in this experiment so as to equate the type of housing system being practised in India by maximum of small and marginal farmers due to its cost effectiveness with regard to farming. The entire husbandry practices were followed under intensive management of complete stall fed Osmanabadi kids. There was no provision for open space.

Feeding and Management

The roughage like widely available hybrid napier grass in chaffed condition was given at the rate of 400 gm twice daily between 8-9 AM in morning and 3-4 PM in evening. Also depending upon the yield, sometime lucerne (250 gm) was also fed. Concentrate was fed at the rate of 150 gm initially and 250 gm after one and half month after 2 hours of roughage feeding in same manner. For feeding facilitation, small drum like feeder was being tightly held along one side of the wall in each pen. For watering purpose, a round waterer was placed in one corner with slight elevation from the floor. These waterer and feeder were cleaned and washed once on every three days. Every effort was put towards achieving dryness in the pen as the urine and droppings were mixed with the floor soil. To overcome this, scrubbing of floor with the help of spade in every 15 days was performed.

Experimental design

The Osmanabadi kids were housed in katcha floor housing system under stall feeding with different floor space for 84 days i.e. 12 weeks. The experiment was started in the month of March and ended in June. So the temperature (40^{o}-45^{o}C) and humidity (85-92%) alternations were kept under normal range by pushing attempts like putting dry tree leaves and sprinkling water on the roof depending on the situation. The group size was kept constant of six goats, but the floor space available for each individual varied from $0.8m^2$, $0.7m^2$ and $0.6m^2$ meaning that they were housed in 3 different group densities. Accordingly, the pen size was designed.

$Gr.T_0$- $0.8m^2$ floor space/kid (total 6 kids) standard floor space as per BIS

$Gr.T_1$- $0.7m^2$/kid (total 6 kids)

$Gr.T_2$- $0.6m^2$/kid (total 6 kids)

The designed pen size were 8ft × 6ft, 7ft × 6ft and 6ft × 6ft for the $Gr.T_0$, T_1 and T_2 respectively. (1square m ≈ 10 square ft)

Following observations were recorded in animals throughout the experiments in all the three groups.

Growth Performance

Weekly body weight

Kids from all the treatment groups weighed weekly by using digital weighing balance and the observations were assessed for calculation of growth rate. The weighing was performed in the morning hour before their feeding. All attention is to given not to impart stress to the animals.

Average Daily Weight Gain (ADG)

Average daily weight gain was calculated for knowing the growth rate in different experimental group by the following formula:

$$\text{Average daily gain (gm/day)} = \frac{\text{Final body weight - Initial body weight}}{\text{No. of days of experiment}}$$

Average weekly weight gain (AWG)

Average weekly weight gain can be calculated by the following formula:

$$\text{Average weekly weight gain (gm/week)} = \frac{\text{Final body weight - Initial body weight}}{\text{No. of weeks of experiment}}$$

Average monthly weight gain (AMG)

Average monthly weight gain can be calculated by the formulae:

$$\text{Average monthly weight gain (gm/month)} = \frac{\text{Final body weight - Initial body weight}}{\text{No. of months of experiment}}$$

Statistical analysis

The data were analysed using RBD (Randomised Block Design) as suggested by Snedor and Cochran (1982).

RESULTS AND DISCUSSION

Weekly body weight

The body weight of kids steadily increased as their age increased. The initial body weight of $T_{0,}$ T_1 and T_2 group was 6.75, 6.86 and 6.82 kg respectively which was increased to 12.69, 12.44 and 11.98 kg respectively at the end of the experiment (12^{th} week). The absolute gain in body weight of groups of kids was 5.94, 5.58 and 5.16 kg for $T_{0,}$ T_1 and T_2 respectively.

The weekly body weight of kids recorded under T_0 and T_2 group and in between T_1 and T_2 group differed significantly ($P<0.01$) whereas no significant difference was found between body weight of kids of T_0 and T_1. It indicated that the body weight of kids reared on $0.6m^2$ (T_2) was less than the kids reared on recommended floor space of $0.8\ m^2$ (T_0). It means that by reducing the floor space per kids the body weight of kids was affected.

The body weight ranged between 5.99 ± 0.11 to 6.09 ± 0.10 kg at 3 months age (Kochewad *et al.,* 2009) and 10.57 ± 0.09 kg at the age of 6 months in Osmanabadi kids (Rathod *et al.,* 2011). The present findings are slightly higher than the findings of Kochewad *et al.* (2009) and Rathod *et al.* (2011). Kumari *et al.* (2013) found the absolute gain in body weight of 9.94 kg to 10.97 kg in Osmanabadi kid which was higher than the present study. This might be due to the different types of housing system. Thiruvenkadan *et al.* (2009) reported higher body weight gain in kids reared on slotted housing system than in katcha housing with mud floor. Similarly Bhakat and Nagpaul (2005) concluded that raised slotted floor with thatched roof shed is the best suited for crossbred female kids in terms of growth, feed conversion efficiency. Lawar *et al.* (2004) reported 13.13 kg body weight at six months of age in Sangamneri goats is in agreement with the present result.

Leme *et al.* (2013) suggested that animal density influenced changing pattern of feed intake and thereby affected the weight gain in lambs. Mohammed (2014) found that body weight gain in space allowance of $0.5\ m^2$ and $1.0m^2$ was lower compared to 1.5 and $2.0\ m^2$ in Egyptian balady goats. These findings are in agreement with the results of present study.

Average daily body weight gain

The average daily weight gain in Osmanabadi kids of group T_0, T_1 & T_2 was 70.77 ± 1.62,66.05 ± 1.80 and 61.50 ± 2.09 gm/day respectively and differed significantly (P<0.01). It indicated that the Osmanabadi kids reared on the standard floor space (0.8 m^2), the per day weight gain was maximum and as the floor space reduced i.e. 0.7 m^2 and 0.6 m^2, the weight gain per day was minimum. It means that weight gain of kids is affected by floor space provided for rearing. This might be due to overstocking of kids resulted in reduced feed intake.. The average daily weight gain declined at the rate of 16.69, 22.67 and 29.70% from 1st to 12th week.

The results of the present research are closely associated with the findings of Krishna and Prasad (1985) who found the average daily gain of 46.0 ± 1.76 to 61.35 ± 3.95 gm/day in goats of more than 3 months of age.

The results are closely associated with the findings of Mohammed (2014) who reported the decreasing of ADG with decreasing the floor space allowance in Goats. Overstocking of goats is closely associated with lower nutritional status and negative body weight gain (Mellado *et al.* 2003). Daily live weight gain per head decreased linearly with increasing stocking rates (Wang *et al.*, 2011). Horten *et al.* (1991) found that reducing floor space from 0.99 m^2 to 0.66 m^2 reduced feed intake and average daily gain. Gonyou *et al.* (1985) reared lambs on 0.32m^2 resulted in poor growth performance. However, Space allowance had no significant effect on growth performances of lambs (Arehart *et al.*, 1969 and Zhang *et al.*, 2009).

Average weekly gain in body weight

As the age of kids advances, the weekly weight gain of kids of all groups showed declining trend. Similar to daily weight gain, the Osmanabadi kids of group T_0 showed the highest (495.39 ± 11.39 gm) weekly body weight gain than other groups. Slight reduction in floor space from 0.8 m^2 (T_0) to 0.7 m^2 (T_1) showed reduction in weekly weight to the tune of 6.08 %. When again floor space reduced by 0.1 m^2 from 0.7 m^2 to 0.6 m^2, the weekly body weight gain reduced by 7.57 %. This again indicated that when floor space reduced by 0.2m^2 from BIS floor space requirement, the weekly body weight gain reduced by 13.99 %. The differences in gain in weekly body weight of Osmanabadi kids of various groups were highly significant (P<0.01). It indicated that the floor space definitely affected the weekly weight gain of Osmanabadi kids. Nasim *et al.* (1981) reported that the average weekly gain ranged between 0.22 to 0.48 kg for different goats. This finding is also in close agreement with present study.

Average monthly gain in body weight

The maximum monthly body weight gain (1981.54 ± 90.24 gm) was seen in kids (T_0) reared on standard floor space (0.8 m^2). As the floor space reduced to 0.7 m^2(T_1) and 0.6m^2 (T_2), the monthly weight gain also reduced to lower values *i.e.* 1861.06 ± 66.23 g and 1722.00 ± 114.48 g respectively. The reducing trend in monthly gain has been observed in all kids. The monthly body weight gain (gm) of Osmanabadi kids reared under 0.8 and 0.7 m^2/kid was at par but the monthly body weight gain (g) of kids reared on 0.6 m^2 differed significantly (P<0.05).

Table 1: Effect of floor space on body weight of Osmanabadi kids

Parameters	GroupT_0 (0.8m^2/kid)	Group T_1 (0.7m^2/kid)	GroupT_2 (0.6m^2/kid)
Initial body weight, kg	6.75 ± 0.57	6.86 ± 0.55	6.82 ± 0.51
Final body weight, kg	12.69 ± 0.15	12.44 ± 0.11	11.98 ± 0.17
Body weight gain, kg	5.94 ± 0.41^a	5.58 ± 0.44^a	5.16 ± 0.46^b
Average daily gain,g/day	70.77 ± 1.62^a	66.05 ± 1.80^b	61.50 ± 2.09^c
Average weekly gain, g/wk	495.39 ± 11.39^a	465.26 ± 11.00^b	430.00 ± 14.64^c
Average monthly gain, g/month	1981.54 ± 90.24^a	1861.06 ± 66.23^a	1722.00 ± 114.48^b

*abc Means in the same row with different superscripts are significantly different at (P < 0.05).

The results indicated that the monthly gain in body weight of kids was not affected due to slight reduction of floor space.

CONCLUSION

There was significant effect of floor space on growth performance of Osmanabadi kids. Thus, from the above findings it can be concluded that there was direct effect of floor space on growth performance of Osmanabadi kids. Hence, the floor space provided per kid was $0.8m^2$ found to be ideal as far as the good marketing and welfare of the animals are concerned.

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