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Effect of grazing hour on growth performance of crossbred sheep from southwest coastal region of Bangladesh

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A B S T R A C T

Sheep are small ruminants that require small amounts of feed and can graze on poor-quality pastures, including fallow lands, roadsides, dikes and playgrounds. Therefore, the experiment was conducted to evaluate the effect of the grazing length on growth performance of crossbred sheep in the southwestern region of Bangladesh. Sixteen crossbred female sheep were divided into four treatment groups and randomly allowed four different grazing periods. The experimental design was based on a randomized complete block design (RCBD). Lambs were initially weighed and grouped by keeping the average weight of the four treatment groups approximately the same. The grazing hours allocated to the four treatment groups were 6, 8, 10 and 12 hours, respectively. During this period, the sheep of particular treatment groups were housed when their allocated grazing period was completed. Empty body weight data were taken fortnightly in the morning before they were allowed to graze. The results revealed that body weight increased with increasing grazing length but the mean difference did not differ significantly ($p>0.05$). In most cases, the highest body weight was observed in sheep grazing for 12 hours per day. Average growth rates of grazing sheep varied significantly between the 6 to 8 hour and 10 to 12 hour grazing groups. But between the 6 to 8 hour grazing group and the 10 and 12 hour grazing group, the growth rate of crossbred sheep did not vary significantly ($p>0.05$). The growth rate (g day^{-1}) of crossbred sheep ranged from 22.44±4.75 to 92.00±11.95, highest in 12 hour grazing group and lowest in 6 hour group. It can be concluded that the body weight and growth rate of crossbred sheep increased with an increase in grazing length. However, 10 hours of grazing meets the requirements for their maintenance and growth due to good pasture quality.

Keywords: Body weight, Crossbred sheep, Grazing length, Growth rate, Performance

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Introduction

Bangladesh suffers from a shortage of livestock products whereas sheep production is expected to provide additional animal protein for these people. In the context of Bangladesh, there are more opportunities for sheep rearing. Being a subtropical country, the climate here is suitable for sheep production. Sheep rearing can greatly contribute to the economy of Bangladesh by generating income and employment opportunities. Sheep rearing can be a source of income during agricultural lean times and can provide financial support to the unemployed. Smallholder farmers are highly attracted to sheep production for high fertility and growth performance of sheep with low investment. About 3.401 million sheep were distributed across the country (DLS, 2017). Of all sheep, 32% are reared in Barind, Jamuna basin and coastal regions of Bangladesh and the rest are distributed throughout the country (Bhuiya, 2006). The average live weight of a sheep is about 15-25 kg (Mukherjee, 2000). Wool is produced as a by-product, which has a huge demand in the world market. The total wool production of coastal sheep is reported to be 853.9 g per sheep in a year (Hassan and Talukder, 2011).

According to Ouédraogo-Koné *et al.* (2006), sheep and goats, two types of small ruminants, feed differently in pasture areas. As they can eat different types of feed depending on local vegetation, sheep show more behavioral flexibility and are able to adapt to new habitats under different environmental conditions (Koluman *et al.*, 2016). Before they begin to graze, sheep visually inspect the pasture to determine the quantity and quality of forage available. Sheep have a natural preference for grass and thus graze, consuming natural or cultivated forage directly from the field. Sheep are known to consume a particularly wide range of grasses and leaves to meet their nutritional needs and are reported to avoid those that may be toxic (Ngwa *et al.*, 2003). Sheep can be grazed on fallow land, roadsides, canal banks, wetlands filled with aquatic weeds, and knee-deep water with little or no concentrate supplementation (Sultana *et al.*, 2010). Therefore, the present study was carried out to evaluate the growth performance of crossbred sheep grazed at different periods.

Materials and Methods

Design of experiment

Sixteen crossbred female sheep (ewes) aged 6 to 8 months were divided into 4 treatment groups. The experimental animals were weighed individually, blocked into four groups according to their initial live weight and assigned at random to four different grazing hours (6, 8, 10 and 12 hours) taking four sheep in each group. The design of the experiment was based on Randomized Complete Block Design (RCBD).

Housing and management of sheep

Sheep were kept on slate floors (made of bamboo) and kept in separate pens. The sheep shed had proper ventilation. The shed and waterers were cleaned regularly. Appropriate bio-security measures were taken to prevent disease. All sheep were dewormed with an anthelminthic injection (Amectin Plus) immediately before the start of the experiment and repeated three months later. All sheep were vaccinated against infectious diseases as shown in Table 1. Fresh drinking water was supplied *ad libitum* to all sheep. All sheep were provided with similar environments and facilities except for the variation in grazing hours.

Table 1. Vaccination schedule of experimental sheep.

Name of vaccine	Quantity/sheep	Route of vaccination
A-mectin plus	0.5 cc	Sub-cutaneous
PPR Vaccine	1.0 ml	Sub-cutaneous

Grazing of sheep

Sheep were allowed to graze in the field laboratory of Agrotechnology Discipline, playground and roadsides of the Khulna University campus. Grazing of sheep started at 6.00 am and ended at 6.00 pm every day. The experiment was continued for 90 days. During this period, sheep under different treatment groups were withdrawn from grazing when their allotted grazing time was over.

Photograph 1. Grazing of experimental sheep at the playground of Khulna University.

Data collection and analysis

Empty body weight data were taken fortnightly in the morning before they were allowed to graze. The growth rate (g day^{-1}) was calculated by subtracting the previous weight from the current weight and dividing by the number of days. Data were analyzed using the GLM method of SAS version 9.1.3 (SAS, 2009). Effects of grazing hours were examined by analysis of variance and DMRT was used to compare treatment means, with significance level considered at $p < 0.05$.

Results and Discussion

Body weight (kg sheep^{-1})

The average body weight of crossbred sheep at fortnight intervals under different grazing hours is shown in Table 2. Results revealed that the body weight increased with the increasing grazing period but the mean differences were not varied significantly ($p>0.05$). In most of the cases the highest body weight was observed in sheep grazed 12 hours per day. Because there were enough natural grasses in their grazing field, the sheep's body weight did not significantly vary throughout the four grazing periods. The body weight of grazing sheep is dependent on both the grazing period and the quality of the pasture.

Table 2. Body weight (kg; Mean ± SE) of crossbred sheep at fortnight intervals under different grazing hours.

Weight at fortnight interval	Grazing period (hours)				P-value
	6	8	10	12	
Initial BW	10.33±2.61	9.70±2.03	9.35±0.94	9.43±0.82	0.978
Second weight	10.7±2.63	10.5±2.06	10.68±0.94	10.92±1.01	0.999
Third weight	11.11±2.52	10.98±1.97	11.60±0.68	12.13±0.94	0.961
Fourth weight	11.59±2.6	11.49±2.06	12.33±0.64	13.15±1.02	0.90
Fifth weight	12.09±2.56	12.02±2.16	13.11±0.46	14.03±0.95	0.83
Sixth weight	12.38±2.57	12.88±1.93	13.77±0.59	15.13±0.94	0.69
Seventh weight	12.77±2.62	13.4±1.96	14.50±0.65	16.01±0.92	0.593
Eighth weight	13.11±2.68	13.86±1.85	15.52±0.64	17.39±0.76	0.356

Growth rate (g day^{-1})

The average growth rate of indigenous sheep at fortnightly intervals during different grazing periods is shown in Table 3. The data in Table 3 show that the growth rate of crossbred sheep increased significantly and progressively with increasing grazing length. Maximum growth rate was observed in sheep fed 12 hour daily grazing but growth rate did not vary significantly between 12 hour and 10 hour groups. In the second weight, the growth rate (g day^{-1}) was highest in 12 hour group (99.89±15.15) followed by 10 hour (88.22±13.10), 8 hour (53.40±2.79) and 6 hour (24.67±3.79) group. At eighth weight, the growth rate (g day^{-1}) of crossbred sheep ranged from 22.44±4.75 to 92.00±11.95 being highest in the 12 hour grazing group and lowest in the 6 hour group. The growth rate of local sheep in Bangladesh before weaning under semi-intensive conditions was reported to be 65.0 g day^{-1} (Sultana *et al.*, 2011).

Zohara *et al.* (2014) reported that the daily weight gain of indigenous sheep in Bangladesh was 21.19 and 40.95 g day^{-1} for grazing and concentrate supplemented groups, respectively. Pervage *et al.* (2009) recorded a growth rate of 51.21 g day^{-1} in indigenous coastal sheep. Ahmed *et al.* (2018) found the growth rate of coastal sheep of Bangladesh to be 91.29 g day^{-1} under intensive rearing conditions. The maximum daily gain was observed in sheep from the coastal region followed by Barind and Jamuna river basin sheep (Ahmed *et al.*, 2018). Different authors (Sultana *et al.*, 2011; Ahmed *et al.*, 2015; Sultana *et al.*, 2017) have mentioned different values for daily weight gain of sheep at 4-9 months of age. Among them, Sultana *et al.* (2017) found higher values from their study for daily gain (118.17-134.33 g day^{-1}) but other studies reported much lower values might be due to differences in feed, age and genotypes of the sheep and condition of the experiments.

Table 3. Growth rate (g d^{-1}; Mean ± SE) of crossbred sheep at fortnight intervals under different grazing hours.

Weight at fortnight interval	Grazing period (hours)				P-value
	6	8	10	12	
Second weight	24.67^{b}±3.79	53.40^{b}±2.79	88.22^{a}±13.10	99.89^{a}±15.15	0.003
Third weight	27.11^{c}±7.14	32.15^{bc}±6.45	61.78^{ab}±17.85	80.67^{a}±5.67	0.021
Fourth weight	32.45±6.22	33.67±6.26	48.67±14.44	67.78±6.46	0.078
Fifth weight	32.89±4.24	35.67±11.67	51.56±12.66	58.44±13.19	0.355
Sixth weight	19.78^{b}±5.17	56.89^{b}±17.87	44.00^{b}±11.85	73.78^{a}±7.06	0.05
Seventh weight	26.00^{b}±3.15	34.89^{b}±7.57	48.89^{b}±8.58	58.22^{a}±9.75	0.05
Eighth weight	22.44^{b}±4.75	30.89^{b}±7.51	67.78^{a}±5.99	92.00^{a}±11.95	0.001

abc, mean with uncommon superscripts in a row differed significantly.

Conclusion

It can be concluded that the body weight and growth rate of crossbred sheep increased with the increase of grazing hours. However, due to the good quality of the pasture, 10 hours of grazing fulfilled their requirements for maintenance and growth.

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Conflict of Interest

The authors declare no conflict of interest regarding the publication of this article.

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