

Study of Berseem Hay and Green Berseem on Growth Performance of Post-Weaned Kundhi Buffalo Calf

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Abstract: Sixteen calves were randomly allocated into two treatment groups, i.e. group A and B and were given a transition period from 6th to 8th week. Group A and B were offered with *ad libitum* berseem hay and green berseem respectively. A calf starter ration was offered *ad libitum* to both the groups. This study remained continued from 9th to 14th week of the age of the calves (six weeks). The results showed that the final mean value of body weight of group A (76.49±1.36 kg/calf) was significantly higher (P<0.05) than that of group B (72.41±1.38kg/calf). Mean feed conversion ratio (FCR) of group A (2.74±0.22 kg/kgBW) was significantly lower (P<0.05) than that of group B (6.95±0.63 kg/kgBW). Average consumption of berseem of group A (3.32±0.25 kg/day) was significantly lower (P<0.05) than that of group B (11.67± 1.023kg/day). Average consumption of calf starter ration (CS) of group A (7.5 ±0. 5223 kg/day) and group B (8.18±0.51kg/day) were non-significant (P>0.05). Average consumption of water of group A (49.56± 2.937 liter/day) was significantly higher (P<0.05) than that of group B (38.47±2.1178 liter/day). The generated income per calf of group A and group B was Rs. 22716.2/calf and Rs. 21060/calf with net profit of Rs. 3852.05/calf and Rs. 2157/calf, respectively. These figures showed that the calves in group A gave Rs. 1695.5/calf more net profit as compared to the calves of group B. It was concluded from this study that calves fed on berseem hay were more economical to rear and gave more profit as compared to the calves fed on green berseem.

Keywords: Berseem Hay &. green Berseem Kundhi Buffalo Tandojam.

INTRODUCTION

Pakistan is an agricultural country whose 70% population is living in the rural areas. Their living depends upon the agriculture and livestock. The buffalo (*Bubalus bubalis*) is the major segment of the livestock. Buffalo is an important contributor to milk, meat, fuel and leather production in many developing countries [1]. Calves are the future of the livestock industry. Essential aspects in the calf rearing are the health management and suitable nutrition to the calves [2]. Blood glucose level suddenly decreases and ketone bodies level increases during post weaning. This is due to the denial of milk to the calves and offering dry feed and roughages that impart volatile fatty acids in the rumen of the calves [3]. During post-weaning, calves is offered all major feed stuffs including dry roughages, green roughages and concentrates for smooth rumen development. Berseem (*Trifolium alexandrinum* L.) is also nutritionally important and abundant roughage. According to an estimate, more than 6.18 million tonnes of green berseem are produced yearly in Pakistan [4]. The nutritive value of dry berseem or

berseem hay is different from green berseem. This species has the advantage over other annual species, providing multiple harvests during the growing season so both can have slightly different effects. There is a call for preservation of forages to assure year around green fodder availability to ruminants [1]. Animal growth and nutrition interact with one another in the sense that each can influence the other. The growth pattern of an animal determines its nutrient requirements [5]. It is necessary to determine the cost effective feeding system that will ensure the profit margin of the farming community. In considering the importance of comparative feeding of berseem hay and green berseem in the field of calves, this study is, therefore, designed to examine the influence of feeding berseem hay and green berseem to the post-weaned calves improve growth performance of the calves and to know that which way of calf rearing is more economically and beneficial for the farmers.

MATERIALS AND METHODS

Sixteen calves having age of six weeks were randomly allocated into two treatment groups, i.e. group A and B, to investigate the comparative effect of berseem hay and green berseem on growth performance of post-weaned Kundhi buffalo calves. Calves were ear tagged for identification, housed under

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Table 1: Nutritive Value of Berseem Hay and Green Berseem

S. No	Nutrients	Berseem Hay	Green Berseem
1	Dry matter%	87.8	18.2
On Dry Matter basis			
2	Crude protein %	15.8	16.1
3	Ether extract %	4.3	3.8
4	N. free extract %	41.1	40.7
5	Crude fiber %	26.4	26.0
6	Ash %	12.8	13.4

hygienic conditions with clean straw bedding and reared at Livestock Experimental Station, Faculty of Animal Husbandry and Veterinary Sciences, Sindh Agriculture University, Tandojam. Study design was as under: Group A was fed with berseem hay *ad libitum* along with calf starter ration (*ad libitum*) and Group B was fed with green berseem *ad libitum* along with calf starter ration (*ad libitum*).

Table 2: Composition of Calf Starter Diet on Dry Matter Basis

Ingredients	Percentage (%)
Ground maize	45.5
Rice polishing	12.5
Sugar cane molasses	4.9
Soybean meal	17.3
Canola meal	11.2
Vegetable oil	4.0
Mineral mixture	12.3
Lime	2.5
Nutrient composition	
Dry Matter (DM)	91.68
Moisture	8.32
On Dry Matter basis	
Crude Protein (CP)	16.5
Ether Extract (EE)	5.44
Metabolizable Energy (ME- KCal/kg)	3200
Acid detergent Fiber (ADF)	25.7
Neutral detergent fiber (NDF)	46.3
Ash	7.49

Materials

Weighing Balance (Manual weighing balance (Yameto Company; China) was used to record weight of experimental animals), Analytical Balance (For weighing calf starter ration and roughage, analytical balance (Mekong Company; Taiwan) was used),

Measuring Tape (To measure the body conformation ((height, heart girth, length) of buffalo calves, measuring tape was used), Plastic rounded bowl (Rounded plastic bowls were used to feed the animals with roughage, concentrate and to provide water separately. Bowls were fixed at different places inside the calves' pen), Ear tag Applicator (All Calves were ear tagged for identification with ear tag applicator, Allflex Company; USA) and Glucometer (The Optimum Exceed Blood Glucose and Ketone Monitoring System (Abbot Company; Pakistan) was used to test blood and ketone level).

Methods

Housing and Management

At experimental station, the calves were housed in separate calf pens made by iron, sized 137.5 × 137.5 × 100 cm (length × width × height). Paddy rice straw was used as bedding material and replaced on daily basis. Animals had access to water *ad libitum* in clean bowl.

Hay Making: Timing

One of the most critical factors in making good quality hay is "timing". Hay making was needed to coincide with the right stage of plant growth and weather conditions. For the current study, berseem was selected that was at pre-flowering stage containing highest nutrients into its stems and leaves.

Mowing of Berseem

Berseem of high green quality was cut early in the morning after the dew was off for the action of the direct sunlight for the purpose of making hay.

Tedding

Berseem was spread flat in windrows for four days at the roof of the sheds of Livestock Experimental Station, Faculty of Animal Husbandry and Veterinary Sciences, Sindh Agriculture University, Tandojam to

preserve its nutritive value. Spreading out the grass just allowed it to dry faster in loosely scattered way to allow aeration.

Turning

During this step, hay was turned upside down twice a day (first turning at 11am and second turning at 3:30 pm) with the help of a long manual turner so as to let the lower parts dry and to avoid combustion. Hay was dried till it broke through twisting and its greenish color remained in the leaves and stems.

Raking

Hay was raked and collected often afternoon when sun was to set and hay took sunlight throughout the day.

Baling

Science and art were covered during hay making with the critical decision that when to start baling. Hay was stored under cover to avoid inhibition of molds, browning and to preserve higher quantity and quality.

Chemical Analysis

Second cut of berseem was offered to the calves throughout the trial and estimation of nutritive value of berseem hay and green berseem was carried out by Animal Nutrition Lab, University of Animal and Veterinary Sciences, Lahore.

Transition Period

Calves were given transition period of two weeks from 6th week of their age to the 8th week to shift these calves from milk to roughage diet. Calves were weaned at the age of 8th week. This study remained continued from 9th to 14th week of the age of calves (six weeks).

Feeding

The calves were weaned completely at the age of 8th week. Chopped hay (approx. 2.5 inch cut size) of berseem and chopped green berseem (approx. 0.5-0.1 inch cut size) were offered to the calves of group A and group B, respectively. Green berseem was offered to the calves within one hour after harvesting. *Ad libitum* calf starter was offered to the calves of both the groups in another bucket but in measured quantity. Refused calf starter was used to be discarded off every morning and fresh calf starter was used to be offered. Water was also offered *ad libitum* to every calf. During this experiment following parameters were recorded:- *Initial body weight, Weekly body weight, Final body weight,*

Weekly body conformation (Length, Girth, Height), Daily feed and water intake, Feed Conversion Ratio, Weekly blood glucose level, Weekly ketone bodies level, Economics.

Statistical Analysis

All the statistical analysis procedures were performed through computerized statistical package i.e. student edition of Statistic (SXW), version 8.1 (copyright 2005, analytical software, USA) and 0.05 was set as a level of significance.

RESULTS AND DISCUSSION

In this present study, it was noted that the mean value of body weight of calves of group A (fed berseem hay) and group B (fed green berseem) was 76.49 ± 1.36 and 72.41 ± 1.38 . The results of present findings, showed that the average body weight gain per calf of group A, 4.07 ± 0.17 kg and group B, 3.17 ± 0.25 per calf was found to be remarkably ($P < 0.05$) shown in Figure 1.

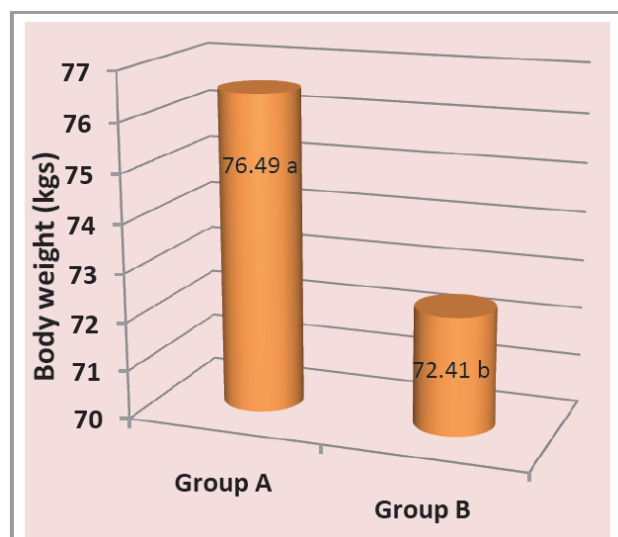


Figure 1: Mean body weight of post-weaned Kundhi buffalo calves fed with berseem hay (Group A) and green berseem (Group B).

The implications of the study of [6] also support our findings. They conducted their research on two weeks old 25 Romanian calves, divided them into 2 groups; group C (control, fed with hay from the beginning) and group E (experimental, fed with alfalfa hay from 8th week) and carried this research till 10th week of their age. They concluded that body weight showed a tendency ($p=0.08$) to be 6% higher in group E than that of group C. The results of the study of [7] also support current study. They showed that calves fed with brome

grass hay, gave more body weight gain than the calves even fed with concentrate. The results of the study of [8] also support current study. They concluded that mulberry hay was palatable than sorghum straw, improved the nutrient utilization of rations and weight gain. Average initial heart girth, length and height of group A and group B was 93, 78, 81.6 cm and 92.8, 77.5, 81.1 cm respectively. Final average heart girth, length and height of group A and group B was 103, 89.38, 92.25 and 100.63, 86.81, 91.38cm respectively. Average heart girth, length and height of group A and group B was 98.95 ± 0.52 cm and 97.24 ± 0.54 cm, 84.60 ± 0.62 cm and 82.70 ± 0.66 cm, 87.56 ± 0.62 cm and 85.33 ± 0.62 cm, respectively. Group A fed with hay gained higher body measurements as compared to group B fed with green berseem. Final heart girth and length of both group A and group B were slightly significant ($P < 0.05$) from each other while height of both group A and group B was non-significant ($P > 0.05$) shown in Figure 2. The results of [9] support current study. They fed alfalfa hay during their two trials involving 280 Holstein heifer calves to determine effects of increasing nutrient intake on growth (weight, height, length and heart girth), dry matter intake, and water intake. Withier height, length and heart girth increased proportionally to the body weight.

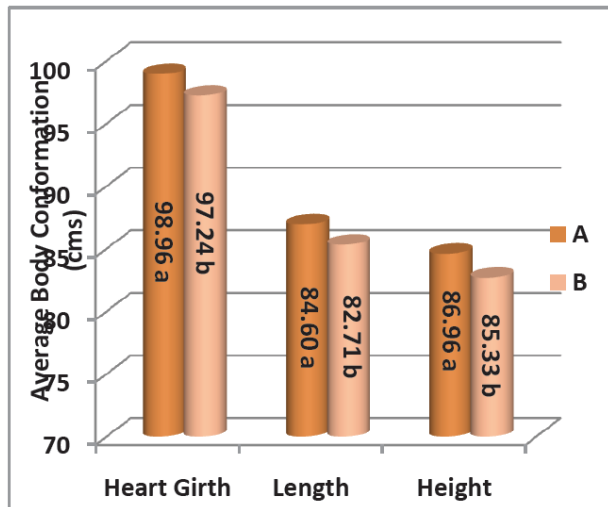


Figure 2: Mean heart girth, length and height of buffalo calves.

Feed consumption (berseem and concentrate) of both group A and group B was 67.64 and 119.09 kg/calf respectively. This is also interestingly important that the group which consumed less feed gave higher body weight gain. DMI of group A and group B was 9.78 kg/day (berseem, 2.91; concentrate, 6.87) and 9.63 kg/day (berseem, 2.12; concentrate, 7.51), respectively.

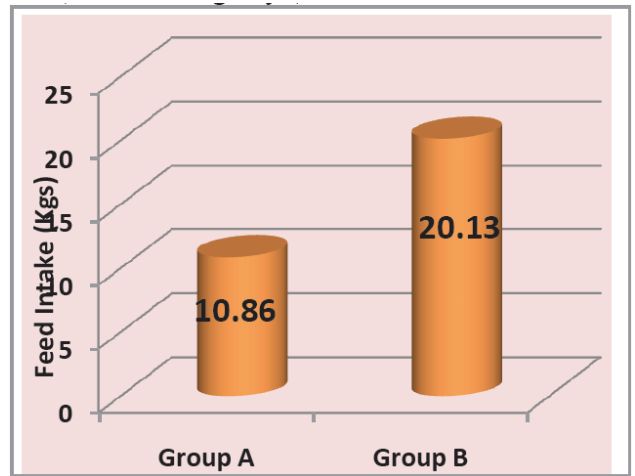


Figure 3: Mean feed intake of post-weaned Kundhi buffalo calves fed with berseem hay (Group A) and green berseem (Group B).

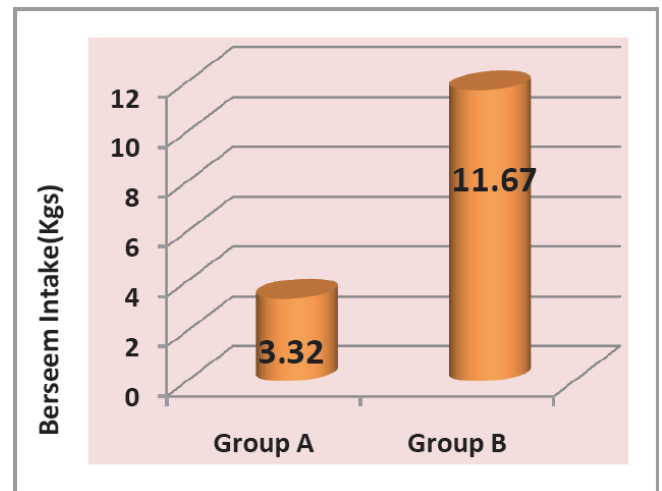


Figure 4: Mean consumption of berseem of post-weaned Kundhi buffalo calves fed with berseem hay (Group A) and green berseem (Group B).

Dry matter intake really matters. Group A was actually fed with berseem hay and current study proved that the DM intake was higher in group A shown in Figures 3, 4 and 5. Previously, [8] revealed similar findings. They reported that DM intake of calves fed with mulberry hay and sorghum straw was 5.59 and 5.15kg/day, respectively. Daily dry matter intake was higher in mulberry-hay fed calves. The implications of the study of [2] also supported the current study. They reported that during wk 6 to 10, calves fed forage (starter plus hay) consumed more total DM than did calves fed no forage. Moreover, mean value showed water consumption of group A as: 49.56 ± 2.937 liter/day and group B as: 38.47 ± 2.1178 liter/day which indicated that group A consumed higher quantity of water as compared to group B. Furthermore, the

statistical analysis (ANOVA) showed significant difference ($P=0.0029$) between group A and group B as shown in Figure 6. The results of [8] also support that when fed *ad libitum* on both programs, alfalfa hay intake was higher in about 5% than grass.

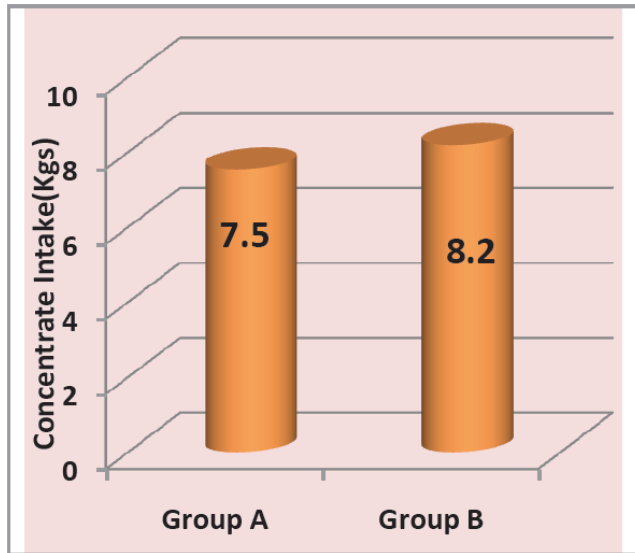


Figure 5: Mean consumption of concentrate of group A (fed with berseem hay and group B (fed with green berseem).

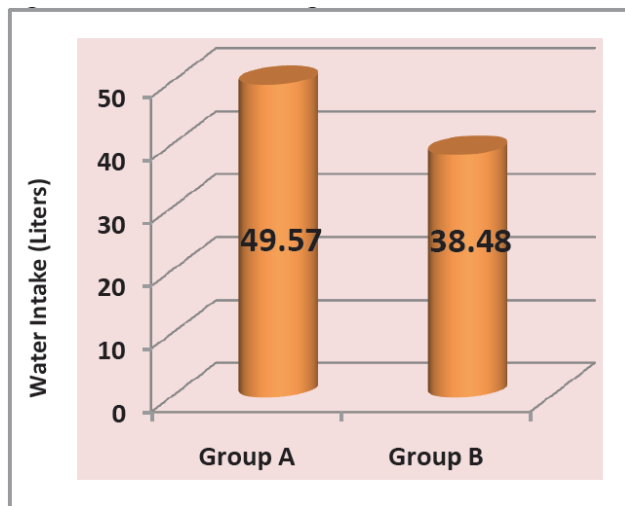


Figure 6: Mean water intake of calves of group A (fed with berseem hay) and group B (fed with green berseem).

Water intake was variable but proportional to dry matter intake. Alfalfa hay was consumed in higher quantity that is why hay-fed heifers consumed higher water. It is well known that faster growth rate may be mainly attributed to an increase in dry matter intake throughout the study period. In the current study, the decrease in concentration was more prominent at week 8 of age when calves were weaned as well as at the end of experiment (week 14). Both the groups, group A (fed berseem hay) and group B (fed green berseem),

lowered their glucose level but their final average blood glucose level was 68.72 ± 0.74 mg/dl and 71.95 ± 1.27 mg/dl respectively and was significantly different ($P < 0.05$) as shown in Figure 7.

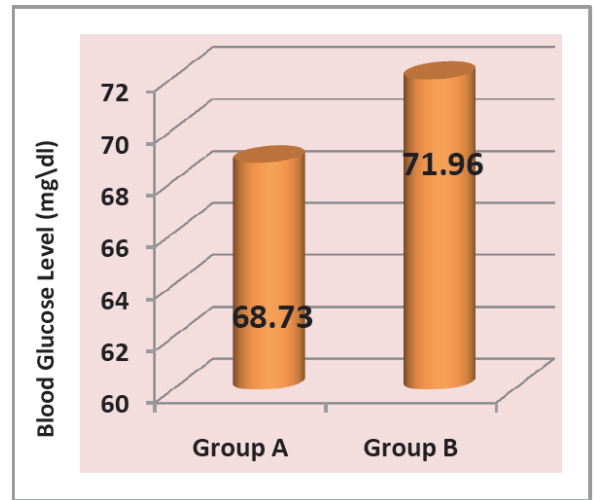


Figure 7: Mean blood glucose level of calves of group A (fed with berseem hay) and group B (fed with green berseem).

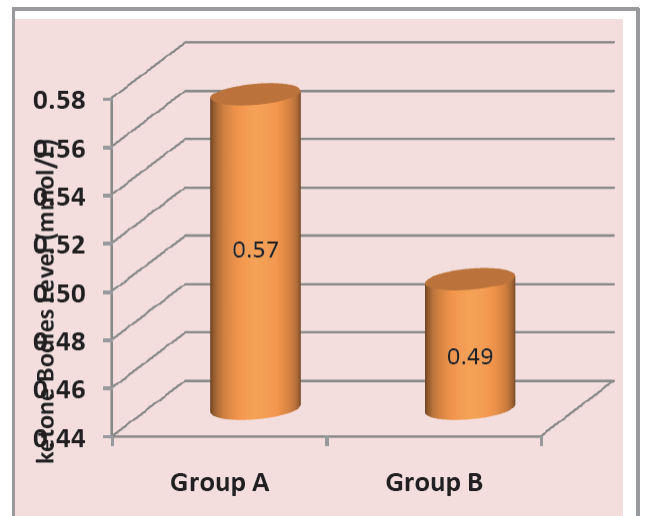


Figure 8: Mean ketone bodies level of calves of group A (fed with berseem hay) and group B (fed with green berseem).

The investigation of [10] also supports the findings of current study, Whereas, [3] reported a lower blood glucose in cattle calves weaned earlier and associated the change with increase in calf starter consumption during the post-weaning period. Ketone bodies are three water-soluble molecules that are produced by the liver from fatty acids during periods of low food intake. In the current study, the increase in concentration of ketone bodies in blood of the calves was more prominent at week 8 of age when calves were weaned as well as at the end of experiment (week 14). Both the groups, group A (fed berseem hay) and group B (fed

green berseem), increased their blood ketone bodies level but their final average blood ketone bodies level was $0.56.72 \pm 0.02$ mmol/L and 0.49 ± 0.02 mmol/L respectively and was significantly different ($P < 0.05$) as shown in Figure 8. Previous study of [3] supports the current study that states that blood ketones increased rapidly with intake of dry feed in young calves rapidly after post-weaning. The study of [11] also supports the current study. They reported that animals in group (B) that fed on berseem hay showed significant ($P < 0.05$) increase in blood ketone bodies level than those which were fed on green berseem in group (A). In the current study, FCR (feed conversion ratio) of both group A and group B was 2.74 ± 0.22 and 6.95 ± 0.63 kg feed/kg BW/calf respectively as shown in Figure 9.

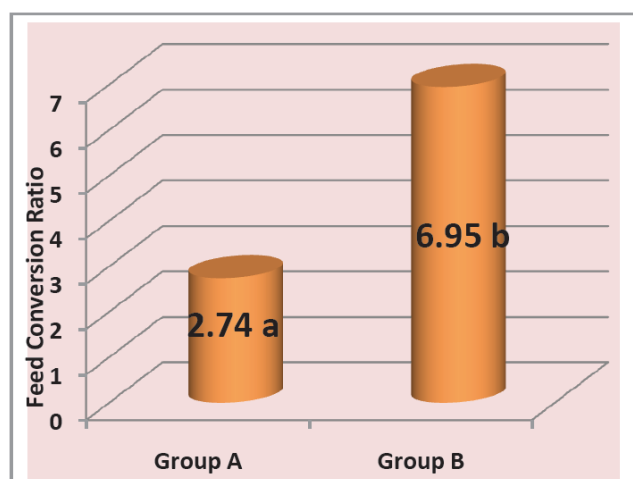


Figure 9: Mean feed conversion ratio of each group of post-weaned Kundhi buffalo calves fed with berseem hay (Group A) and green berseem (Group B).

The findings of the study of [12] also support the results of the current study. They conducted their research on steers and reported that the lowest FCR (5.93) observed in group 3 (animals fed 66% CS and 60% hay portion) with a significant difference with groups 1 and 4. Every farmer wishes to rear his calf economically. In the current study, per calf, net profit of group A and group B was 3852.05 Rs and 2157 Rs, respectively. Every calf of group A (fed with hay) gave 1695.5 Rs more profit than that of the calves of group B (fed with green berseem). This profit came from saving the concentrate because every calf of group A (fed Hay) saved 3.86 kg of concentrate and average saved-concentrate during the study by group A was 0.7kg per day. Overall group A (fed with hay) saved 30.88 kg concentrate in 6 weeks after their weaning from week 8 to 14. The findings of the study of [8] are in the line with current study. Their study reduced the cost by saving 0.66 kg of concentrate per animal per day in growing crossbred calves. The implications of the study of [6]

also support findings of the current study. They conducted their research on two weeks old 25 Romanian calves, divided them into 2 groups; group C (control, fed with hay from the beginning) and group E (experimental, fed with alfalfa hay from 8th week) and carried this research till 10th week of their age. They concluded that production costs were 0.15 EURO/kg (8%) lower in group than that of group C. It was noted from this research and other parts of the world are on the similar aspects that those calves which were fed with hay, they gained more weight, higher feed consumption and dry matter intake, higher body measurements (heart girth, length, height), lower feed conversion ratio, higher ketone bodies level and lower glucose level and finally they were reared more economical as compared to the calves which were fed with green roughage.

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