FEEDLOT PERFORMANCE AND SERUM PROFILE OF BUFFALO (*BUBALUS BUBALIS*) CALVES UNDER HIGH INPUT FEEDING SYSTEMS

Asim Faraz[1,*], Abdul Waheed[1], Nasir Ali Tauqir[2], Hafiz Muhammad Ishaq[1], Farhat Iqbal[3] and Zil-e-Huma[4]

ABSTRACT

The current study was undertaken to evaluate the growth performance and blood biochemical analysis of buffalo calves kept under feedlot by feeding two dietary regimes. Twenty male calves of 9-12 months of age, 115±10 kg body weight were divided into two groups with initial group weight of 1,165±05 kg. They were fed two diets as Ration-I (3,200 Kcal and 16%) and Ration-II as (3,400 Kcal and 18%). Regarding roughage proportion maize fodder and wheat straw were fed. Daily feeding allowance was offered as 3% body weight. Water was available 24 h. Deworming was performed. Trial was lasted for 120 days. At end of the trial blood is collected and tested for different biochemical indices. Data collected on different parameters were analyzed by using t-test on Statistix software. Significant Overall weight gain and average daily weight gain ($P<0.05$) was observed as 78±2.54, 94±1.15 kg and 652±12.24, 783±9.62 g/d with Ration I and Ration II, respectively. While feed intake ($P>0.05$) of concentrate, fodder and wheat straw was 2.35±0.05, 2.51±0.07; 8.81±0.23; 9.38±0.22 and 1±0.00, 1.03±0.04 kg/d with Ration I and Ration II, respectively. Regarding serum profile cholesterol concentration ($P<0.05$) was found to be 55.86±0.33 and 56.87±0.72 with Ration I and Ration II, respectively. The results indicate that buffalo calves have a great growth potential which can be manipulated by modern husbandry practices.

Keywords: *Bubalus bubalis*, buffaloes, fattening, intensive, management system, growth, buffalo calves

INTRODUCTION

Buffalo is a leading animal species for beef production in tropical and sub-tropical climate of the world - Pakistan is not exception to this. In Pakistan per capita availability of meat is less in terms of quality and quantity as well. The demand for meat is increasing day by day but its production is not increasing at same pace. The annual beef production in Pakistan is 2 million tones which is not enough to meet the needs of our masses. On the other side farmer has to face economic and production losses due to high mortality and morbidity rate in the form of poor nutrition and

[1]Department of Livestock and Poultry Production, Faculty of Veterinary Sciences, Bahauddin Zakariya University, Multan, Pakistan, *E-mail: drasimfaraz@bzu.edu.pk
[2]Department of Animal Science, University of Sargodha, Panjab, Pakistan
[3]Department of Statistics, University of Balochistan-Quetta, Balochistan, Pakistan
[4]Department of Zoology, Sardar Bahadur Khan Women's University, Quetta, Pakistan

stunted growth. This situation delays the maturity by reduced growth and results in low quantity of beef with poor quality.

Subsistence level farming and traditional feeding system are major factors which affect the growth of buffalo calves so results in reduced weight gains in Pakistan. Mostly the animals are raised in grazing system or given seasonally cultivated fodder so growth is compromised due to the poor quality feeding stuffs characterized by low energy and protein while high fiber contents (Sarwar *et al*., 2002). High input feeding system with optimum energy and protein levels is among the most important factors which govern the ruminant productivity. Inadequate provision of primary nutrients leads to reduced productivity due to inefficiency in nutrient utilization (Tauqir *et al*., 2011). Feeding system based on scientific lines in ruminants not only reduces the hazards associated with deficiency or excess of any nutrient but also ensure the optimum rumen microbial proliferations and fermentation which optimize amino acids supply post ruminal and energy production. Coupling of energy and protein ensure very sustainable availability of the structural components to ruminal microbes for multiplication (Sarwar *et al*., 1996).

Ruminant animal productivity governs by two important factors which are nitrogen (dietary protein) and carbon (energy). Adequate balancing of CP and ME optimizes the nutrient utilization and growth of animals (Lammers and Heinrichs, 2000). Feeding of high protein and energy levels to growing calves is a nutritional tool to uplift the profitability of feedlot enterprise which can enhance the meat production in the country. Volatile fatty acids production rate is high in buffaloes while turnover time is quiet lower than cattle which favor it for feedlot system. Moreover the feed degradability in rumen is more in buffaloes than in cattle (Punia and Sharma, 1990). The energy requirements for maintenance are lower than cattle due to its more relaxed behavior while dry matter intake and digestibility of nutrients is higher in buffalo calves (Singh *et al*., 2003). Feedlot practices of the male buffalo calves are well recognized now a day in some buffalo populated countries (Mandal *et al*., 2000; Yunus *et al*., 2004). Under local conditions the prospects of beef production from buffalo husbandry are famous now and the buffalo under feedlot systems have shown to possess a high potential of quality carcass production (Bharadwaj and Sethi, 2000; Udeybir and Mandal, 2001).

The common used methods for the assessment of nutritional status of animal are weight gain and body condition scoring but addition to this the study of blood metabolites is becoming a new popular method for assessing the nutritional condition of the animals (Ndlovu *et al*., 2007). Hence this study was planned to evaluate the growth response of buffalo male calves with supplementation of high protein and energy rations while blood chemistry picture was also studied to check the indirect effects on growth.

MATERIALS AND METHODS

Before the start of the experiment the buffalo (Nili-Ravi) calves were marked for identification and were dewormed with Ivermectin 1 ml / 50 kg bodyweight to reduce the parasitic load. Calves were provided semi-open housing throughout the trial. Initial body weights of the calves were recorded before shifting them to the respective treatment groups and thereafter all the experimental calves were weighed fortnightly before their morning feeding. The trial was of 120

days with 15 days as adaptation period.

Twenty male calves of 9 to 12 months of age, 115±10 kg body weight were divided into two groups with initial group weight of 1,165±05 kg and raised in stall-fed conditions. They were fed two diets with different energy and protein levels as Ration I (3,200 Kcal and 16%) and Ration II as (3400 Kcal and 18%). The chemical composition of experimental rations is shown below (Table 1). Regarding roughage proportion maize fodder and wheat straw were fed. Daily feeding allowance 3% body weight was calculated and adjusted according to fortnightly weighing. Water was available round the clock *adlib*.

The growth rate of the calves was calculated. The calves were weighed on 15 d interval before morning feeding. At the end of experiment, blood samples were collected from all calves for hematological analysis by jugular puncture in two sets. One contained EDTA as anticoagulant and the other without EDTA for serum separation. The blood samples were studied for hematological and biochemical analysis i.e. hemoglobin (Hb), cholesterol, triglycerides, urea, concentration of total protein and albumin. Hemoglobin (Hb) in blood sample while cholesterol, triglyceride, urea, total protein and albumin in serum samples were estimated by using standard kits method in biochemistry analyzer (Techno-786), respectively (AOAC, 1997).

Statistical analysis

MS excel was used for compilation of data collected on different parameters then were analyzed by using t-test (Steel *et al*., 1997) on Statistix 8.1 software.

RESULTS AND DISCUSSION

Growth rate

On overall basis, buffalo calves attained 78 and 94 kg ($P<0.05$) weight in Group I and Group II with feeding of Ration I and Ration II, respectively during the feedlot experiment of 120 days in intensive feeding management system. The average daily weight gain (DWG) of buffalo calves was 652 and 783 g/d ($P<0.05$), respectively with Ration I and Ration II (Table 2). These values are in agreement with the findings of Ahmad *et al*. (2013) who reported 752 g/d daily gain (growth rate) in buffalo calves under feedlot system in Khyber Pakhtunkhwa province of Pakistan. Rashid *et al*. (2013) reported 637 g/d daily weight gain in early weaned male buffalo calves. In a study Mahmoudzadeh *et al*. (2007) checked the response of the male buffalo calves to different levels of protein and energy in finishing diets and reported range for daily weight gain as 503 to 951 g/d on different energy and protein rations. Jabbar *et al*. (2009) studied comparative performance of calves of buffalo and different breeds of cattle on feedlot fattening and reported range of daily weight gain as 849 to 937 g/d in calves. Pathak *et al*. (1987) reported 607 g/d daily gain in Indian male buffalo calves fed on high protein and high energy diets. Gundran and More (1999) observed the growth of water-buffalo calves in Philippines and reported range for average daily weight gain as 200 to 1,200 g/d with a mean of 700 g/d.

Current findings are not in agreement with the findings of Afzal *et al*. (2009) which compared the growth of male buffalo calves in open grazing and stall feeding system and reported 415 g/d weight gain in open grazing while 433 g/d in stall fed groups where only fodder was supplied in cut and carry system. Tahir *et al*. (1989) reported 520

g/d in male buffalo calves fed on Sudan sorghum hybrid. Shahzad *et al*. (2010) reported 558 g/d daily weight gain in male buffalo calves which fed on ration with CP 14%. Tauqir *et al*. (2011) reported 470 g/d daily weight gain in 6 to 7 months old male buffalo calves which fed on medium protein (14%) and high energy (2.23 Mcal/kg) diets. Ahmad *et al*. (2004) studied the effect of calf starter ration and conventional dairy ration with 18% CP in male buffalo calves and found the average daily weight gain as 470 and 340 g/d in calf starter and conventional groups respectively.

Regarding growth rate studies in India, Pannu *et al*. (2002) reported 298 g/d daily weight gain in 12 months old Indian male buffalo calves which fed on deoiled mustard-cake with naturally fermented wheat-straw based complete feeds. Singh *et al*. (2009) investigated dietary energy levels response on growth in Bhadawari buffalo calves; they used 8 months old calves in a trial and offered different feeding regimens. Reported daily weight gain was 374 g/d in a group fed with chaffed sorghum hay adlib with a concentrate of 18.5% CP and 3.04 Mcal/kg energy. Madan *et al*. (2009) studied the growth of male buffalo calves in response to consumption of high fluoride contents, they used 10 to 12 months old Murrah buffalo calves in their study and fed wheat-straw, concentrate-mixture and 3 kg greens daily to control group and reported 375 g/d daily weight gain. Kumar and Dass (2006) investigated the effect of niacin supplementation on growth of male buffalo calves and reported 500 g/d in the control group which fed with wheat-straw and concentrate-mixture with no niacin supplementation.

Feed intake

The average daily intake (ADI) of concentrate, fodder and wheat straw was 2.35, 2.51; 8.81, 9.38 and 1, 1.03 kg, respectively with Ration I and Ration II (Table 3). Nonsignificant difference ($P>0.05$) was found between two groups regarding feed intake. These findings are very close to the values reported by Pathak *et al*. (1987) who studied growth response and feed efficiency in Indian male buffalo calves which fed on high energy and protein diets and found 7.5 kg daily dry matter intake. Mahmoudzadeh *et al*. (2007) checked the response of the male buffalo calves to different levels of protein and energy in the finishing diets and reported range for daily weight gain as 503 to 951 g/d with DMI range as 4.56 to 6.71 kg/d on different energy and protein rations. Shahzad *et al*. (2010) reported 3.85 g/d dry matter intake for per kg weight gain in the male buffalo calves which fed on ration with CP 14%. Tauqir *et al*. (2011) reported 2.36 kg/d DMI for 470 g/d daily weight gain in 6 to 7 months old male buffalo calves which fed on medium protein (14%) and high energy (2.23 Mcal/kg) diets. Ahmad *et al*. (2004) investigated the effect of calf starter ration and conventional dairy ration with 18% CP in buffalo calves and found average feed intake as 0.95 and 0.57 kg/d in calf starter and in the conventional groups respectively.

Singh *et al*. (2009) investigated dietary energy levels response on the growth and nutrient utilization in Bhadawari male buffalo calves; reported daily weight gain was 374 g/d in a 8 months old group fed with chaffed sorghum hay adlib with a concentrate of 18.5% CP and 3.04 Mcal/kg energy while dry matter intake was 2 kg for roughage, 0.71 kg for concentrate with a total of 2.71 kg/d. Madan *et al*. (2009) investigated the growth of Indian Murrah buffalo calves consuming high levels of fluoride, 10 to 12 months old calves were used in their study and fed with wheat straw+concentrate+3 kg greens per day to control group. The reported average dry matter intake was

Table 1. Chemical composition of experimental rations.

Parameters (%)	Ration I	Ration II
DM	88	91.19
CP	16	18.09
Ether extract	6	7
Crude fiber	10-14	10-14
Total Ash	12	12
TDN	75	75
ME (Kcal/kg DM)	3,200	3,400

Table 2. Overall weight gain (kg) and growth rate (g/d) of male buffalo calves fed with Ration I and Ration II.

Parameters	Ration I	Ration II
Initial weight	116.80±5.6	116.10±4.20
Growth at 30 d	17.6+0.27	21.6+0.17
Growth at 60 d	19.3±0.37	23.5±0.21
Growth at 90 d	20±0.15	23.6±0.06
Growth at 120 d	21.4±0.72	25.2±0.14
Overall weight gain	78±2.54 [a]	94±1.15 [b]
Daily weight gain	652±12.24 [a]	783±9.62 [b]

Table 3. Average male buffalo calves' feed intake (kg) fed with Ration I and Ration II.

Parameters	Ration I	Ration II
Concentrate	2.35±0.05	2.51±0.07
Fodder	8.81±0.23	9.38±0.22
Wheat straw	1±0.00	1.03±0.04

Table 4. Blood biochemicals of male camel calves fed with Ration I and Ration II.

Parameters	Ration I	Ration II
Hemoglobin (gm/dL)	12.96±0.41	13.7±0.56
Cholesterol (mg/dL)	55.86±0.33 [a]	56.87±0.72 [b]
Triglycerides (mg/dL)	26.67±0.40	27.61±0.37
Urea (mg/dL)	40.05±0.53	40.82±0.73
Creatinine (mg/dL)	1.33±0.04	1.35±0.06
Total protein (gm/dL)	7.11±0.25	7.28±0.34
Albumin (gm/dL)	3.31±0.30	3.58±0.29
Sugar (mg/dL)	63.58±1.36	64.49±1.34

found to be 3.42 kg/d. Kumar and Dass (2006) evaluated the effect of niacin supplementation on growth of male buffalo calves and found average daily intake of concentrate mixture, wheat straw as 2.04 and 1.52 kg/d in control group.

Blood biochemicals

The values of blood metabolites like hemoglobin, cholesterol, triglycerides, urea, creatinine, total protein, albumin and sugar in buffalo calves under intensive management system are given in Table 4. The mean values for hemoglobin was found to be significant ($P<0.05$) for buffalo calves in IMS. The values were found to be normal and on higher side, may be due to the fact that the calves were in active metabolic state. Rashid *et al*. (2013) reported glucose and blood urea nitrogen as 36.4 and 42.9 mg/dl in early weaned male buffalo calves.

Tiwari *et al*. (2001) studied blood biochemical constituents in the growing male buffalo calves, they divided 18 male intact Murrah buffalo calves of 6 to 10 months of age into three groups and fed adlibitum urea-ammoniated wheat-straw and concentrate-mixture with untreated groundnut cake (Group I); adlibitum urea-ammoniated wheat-straw and concentrate-mixture with formaldehyde treated groundnut cake (Group II); adlibitum urea-ammoniated wheat-straw and concentrate-mixture with fish meal (Group III). They found glucose and total protein as 64.1, 6.2; 57.3, 5.6; 51.9, 7 mg% and g% respectively in Group I, II and III. Pannu *et al*. (2002) reported values for protein, albumin, globulin, blood urea, glucose and creatinine as 6.91, 2.60, 4.32, 22.95, 52.50 and 2.96 mg% in 12 months old Indian male buffalo calves which fed on deoiled mustard-cake with naturally fermented wheat-straw based complete feeds.

Kumar and Dass (2006) investigated the effects of niacin supplementation on blood biochemical profile in the male buffalo calves and observed values as glucose 56.18 mg/dl, total protein 6.76 g/dl, globulin 3.52 g/dl, albumin 3.24 g/dl, cholesterol 139.28 mg/dl and urea nitrogen 22.42 mg/dl in the control group which fed with wheat-straw and concentrate-mixture having no niacin supplementation. Maurya and Singh (2015) assessed the blood biochemical profile of buffaloes under field conditions; they found values for blood glucose, total protein, albumin and cholesterol as 57.6 mg/dl, 6.85 g/dl, 3.08 g/dl, 95.27 mg/dl, respectively in pooled population.

CONCLUSION

Offering two levels of protein and energy (16%, 3,200 Kcal and 18%, 3,400 Kcal) to buffalo calves indicates that calves can attain a growth rate of ~ 0.7 to 0.8 kg/d. If given better facilities and care, this growth rate can be even higher. This indicates a great potential of feedlot and become a good candidate for feedlot system in Pakistan. Buffalo can play a pivotal role to bridge the meat shortage in the country.

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REFERENCES

Afzal, M., M. Anwar, M.A. Mirza and S.M.H.

Andrabi. 2009. Comparison of growth rate of male buffalo calves under open grazing and stall feeding system. *Pakistan Journal of Nutrition*, **8**(2): 187-188. DOI:10.3923/pjn.2009.187.188

Ahmad, F., M.A. Jabbar, I. Ahmad, M. Rafique and I. Ahmad. 2004. Comparative efficiency of calf starter and conventional rations in buffalo suckling calves. *Pak. Vet. J*., **24**(4): 169-172. Available on: https://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.492.6053&rep=rep1&type=pdf

Ahmad, S., Z.U. Haq, G. Jabbar, Y. Muhammad, S. Sultan, Ihsanullah and D. Khan. 2013. Growth performance of calves in Khyber Pakhtunkhwa, Pakistan. *J. Anim. Plant Sci*., **23**(Suppl. 1): 98-102.

AOAC. 1997. *Official Methods of Analysis*. Association of Official Analytical Chemists, Washington D.C., USA.

Bharadwaj, A. and R.K. Sethi. 2000. Meat production potential in Murrah buffalo male calves under different systems of feeding management. *Indian J. Anim. Sci*., **70**(7): 769-770.

Gundran, R.S. and S.J. More. 1999. Health and growth of water-buffalo calves in Nueva Ecija, the Philippines. *Prev. Vet. Med*., **40**(2): 87-100. DOI: 10.1016/s0167-5877(99)00034-3

Jabbar, M.A., A. Rehman, M. Fiaz, A.H. Gilani, T.N. Pasha and I.B. Marghazani. 2009. Comparative performance of calves of buffalo and different breeds of cattle on feedlot fattening. *Pak.. J. Zool*., **9**: 401-407.

Kumar, R., and R.S. Dass. 2006. Effect of niacin supplementation on growth, nutrient utilization and blood biochemical profile in male buffalo calves. *Asian Austral. J. Anim*., **19**(10): 1422-1428. DOI: 10.5713/AJAS.2006.1422

Lammers, B.P. and A.J. Heinrichs. 2000. The response of altering the ratio of dietary protein to energy on growth, feed efficiency, and mammary development in rapidly growing prepubertal heifers. *J. Dairy. Sci*., **83**(5): 977-983. DOI: 10.3168/jds.S0022-0302(00)74962-9

Madan, J., J.P. Puri and J.K. Singh. 2009. Growth, feed efficiency and blood profile of buffalo calves consuming high levels of fluoride. *Trop. Anim. Health Prod*., **41**(3): 295-298. DOI: 10.1007/s11250-008-9189-3

Mahmoudzadeh, H., H. Fazaeli, I. Kordnejad and H.R. Mirzaei. 2007. Response of male buffalo calves to different levels of energy and protein in finishing diets. *Pakistan Journal of Biological Sciences*, **10**(9): 1398-1405. DOI: 10.3923/pjbs.2007.1398.1405

Mandal, P., R.B. Sah, R.D. Pandit, B.P. Budhnagaria and R.S. Mandal. 2000. Studies on the effect of different feeding management on growth performance of Murrah buffalo heifers, p. 127-131. *In Proceedings of the 4th National Workshop on Livestock and Fisheries Research in Nepal*, Agricultural Research Station, Tarahara, Nepal.

Maurya, S.K. and O.P. Singh. 2015. Assessment of blood biochemical profile and nutritional status of buffaloes under field conditions. *Buffalo Bull*., **34**(2): 161-167. Available on: https://www.lib.ku.ac.th/KU/2560/IBBU201502005.pdf

Ndlovu, T., M. Chimonyo, A.I. Okoh, V. Muchenje, K. Dzama and J.G. Raats. 2007. Assessing the nutritional status of beef cattle: current practices and future prospects. *Afr. J. Biotechnol*., **6**(24): 2727-2734. DOI: 10.5897/

AJB2007.000-2436

Pannu, M.S., J.R. Kaushal, M. Wadhwa and M.P.S. Bakshi. 2002. Effect of naturally fermented wheat straw based complete feeds on the growth of buffalo calves. *Asian Austral. J. Anim.*, **15**(11): 1568-1572. DOI: 10.5713/ajas.2002.1568

Pathak, N.N., S.K. Ranjhan and K.K. Baruah. 1987. Growth response, feed efficiency and carcass characteristics of indian buffalo (*Bubalus bubalis*) calves fattened on different planes of nutrition. *Buffalo Bull.*, **6**(4): 77-82. Available on: http://ibic.lib.ku.ac.th/e-Bulletin/IBBU198700008.pdf

Punia, B.S. and D.D. Sharma. 1990. Influence of dietary energy on ruminal VFA production rate in buffaloes and cattle. *Indian J. Anim. Sci.*, **60**(7): 888-892.

Rashid, M.A., T.N. Pasha, M.A. Jabbar, A. Ijaz, H. Rehman and M.S. Yousaf. 2013. Influence of weaning regimen on intake, growth characteristics and plasma blood metabolites in male buffalo calves. *Animal*, **7**(9): 1472-1478. DOI: 10.1017/S1751731113000943

Sarwar, M., M.A. Khan and I. Zafar. 2002. Feed resources for livestock in Pakistan. *Int. J. Agric. Biol.*, **4**(1): 186-191.

Sarwar, M., S. Mahmood, W. Abbas and C.S. Ali. 1996. *In situ* ruminal degradation kinetics of forages and feed by-products in male Nili-Ravi buffalo calves. *Asian Austral. J. Anim.*, **9**(5): 107-115. DOI: 10.5713/ajas.1996.533

Shahzad, M.A., N.A. Tauqir, F. Ahmad, M.U. Nisa, M. Sarwar and M.A. Tipu. 2010. Effects of feeding different dietary protein and energy levels on the performance of 12-15-month-old buffalo calves. *Trop. Anim. Health Prod.*, **43**(3): 685-694. DOI: 10.1007/s11250-010-9753-5

Singh, R., S. Kishan and J.J. Kishan. 2003. Comparative efficiency of nutrient utilization in buffalo, Hariana and cross-bred calves fed cereal free ration. *Indian. J. Anim. Nutr.*, **20**(1): 6-10.

Singh, S., S.S. Kundu, B.P. Kushwaha and S.B. Maity. 2009. Dietary energy levels response on nutrient utilization, nitrogen balance and growth in Bhadawari buffalo calves. *Livestock Research Rural Development*, **21**(8).

Statistix 8.1 *Analyt+ical Software*. Available on: https://statistix.informer.com › Education › Science › Statistix.

Steel, R.G.D., J.H. Torrie and D.A. Dicky. 1997. Principles and procedures of statistics. *A Biometric Approach 3rd ed.* McGraw Hill Book Co., New York, USA.

Tahir, M.S., S. Rehman and S. Javed. 1989. Economics of fattening of male buffalo calves fed on Sudan sorghum hybrid. *Pak. Vet. J.*, **9**: 146-147.

Tauqir, N.A., M.A. Shahzad, M. Nisa, M. Sarwar, M. Fayyaz and M.A. Tipu. 2011. Response of growing buffalo calves to various energy and protein concentrations. *Livest. Sci.*, **137**(1-3): 66-72. DOI: 10.1016/j.livsci.2010.10.003

Tiwari, C.M., A.S. Chandramoni, S.B. Jadhao, B.K. Gowda and M.Y. Khan. 2001. Studies on blood biochemical constituents and rumen fermentation in growing buffalo calves fed ammoniated straw-based rations supplemented with different protein sources. *Anim. Feed Sci. Tech.*, **89**(1-2): 119-130. DOI: 10.1016/S0377-8401(01)00191-2

Udeybir, A. and B. Mandal. 2001. Energy and protein requirements for growing buffaloes. *Buffalo J.*, **17**: 163-178.

Yunus, A.W., A.G. Khan, Z. Alam, J.I. Sultan and M. Riaz. 2004. Effects of substituting cottonseed meal with sunflower meal in rations for growing buffalo calves. *Asian Austral J. Anim. Sci*., **17**(5): 659-662. DOI: 10.5713/ajas.2004.659