Journal of Animal Research: v.6 n.1, p. 167-170. February 2016

DOI: 10.5958/2277-940X.2016.00027.9

SHORT COMMUNICATION

Blood Biochemical Profile and Nutritional Status of Dairy Cows under Field Conditions

Satyendra Kumar Maurya[1]* and Om Prakash Singh[2]

[1]Department of Veterinary Biochemistry, College of Veterinary Science, Narendra Deva University of Agriculture and Technology, Kumarganj, Faizabad, Uttar Pradesh, INDIA
[2]UP College, Varanasi, Uttar Pradesh, INDIA

** Corresponding author: SK Maurya; Email:*skmaurya@yahoo.com

Received: 08 September, 2015 **Accepted**: 09 January, 2016

ABSTRACT

Present investigation was conducted to assess the serum biochemical profiles along with nutritional status of cattle under field conditions. The animals were grouped in to four categories depending on the land holding capacity of the farmers viz. landless, marginal, small and large. The nutritional status of the animals was assessed by measurement of body weight (BW) and body condition scores (BCS) and supplemented with blood biochemical profiling. The BW and BCS in pooled population were 316.63 ± 1.339 and 3.86 ± 0.037 respectively. BCS of cattle differed significantly ($P<0.05$) among all groups. The BW of cattle in landless category differed significantly ($P<0.05$) to all other categories. The values for blood glucose, total protein, albumin, A/G ratio and cholesterol were within normal range, whereas, serum Ca and P were below normal. The values of blood glucose, total protein, albumin, A/G ratio and Calcium showed no significant difference among all groups. The serum cholesterol of large category differed significantly ($P<0.05$) with landless and small category. The serum calcium of large category differed significantly ($P<0.05$) with landless and marginal category. It is concluded that cattle of this area are deficit in calcium and phosphorus though the nutritional requirements are being met.

Keywords: Nutritional status, Cattle, Blood biochemical profile

Nutritional status of animals is very important and is a basic measure of health and productivity of animals. Conventional and common methods to assess nutritional status of animals include: Body weights and body condition scoring. Use of blood metabolites in assessing nutritional status of cattle is becoming popular (Ndlovu *et al.* 2007; Maurya and Singh 2015).

There are some blood metabolites which are related to the nutritional status of the cattle, they represent animal response to the nutrition. Blood variables like total proteins are related to protein status of the animal. Phosphorus has no direct mechanism of regulation, although calcium regulating hormones directly affect its blood concentration. Calcium and phosphorus have important bone reserves, while the magnesium reserve is low and has no primary hormonal response for the compensation (Martens and Schweigel 2000; Larsen *et al.* 2001). Calcium works as a cofactor or activator of various enzyme systems. Disturbance in calcium and phosphorus ratio has been associated with subnormal fertility and anestrus conditions (Moddie 1965).

Blood metabolites can be used objectively, reliably and routinely to assess the nutritional status of cattle. In India, the use of blood metabolites of field cattle is rare due to lack of equipments and the high cost of blood biochemical analysis. Several factors, such as physiological status of an animal, breed, nutrition, season and age reported to affect levels of blood metabolites. Combining body weights, body condition scores and blood metabolites increase accuracy of assessing the nutritional state and welfare of cattle population.

Small farms usually produce milk and rear calves. Their productivity is quite low and the diet is forage based with low quantities of concentrates. In regions where the intensive farming is not possible they are important for

Table 1: Body weight, BCS and Blood Biochemical parameters of Cows in different groups of farmers

Parameter/ Animal	Landless	Marginal	Small	Large	Pooled
Body weight (Kg)	290.15 ± 1.958[a]	312.74 ± 1.536[b]	318.87 ± 1.586[b]	361.37 ± 3.651[c]	316.63 ± 1.339
BCS	3.06 ± 0.072[a]	3.81 ± 0.049[b]	4.04 ± 0.047[c]	4.69 ± 0.086[d]	3.86 ± 0.037
Blood Glucose (mg/ dl)	50.31 ± 1.309	51.27 ± 1.284	52.63 ± 1.022	54.37 ± 0.786	52.14 ± 0.591
Total Protein (g/ dl)	6.88 ± 0.098	7.05 ± 0.064	7.12 ± 0.078	7.10 ± 0.097	7.04 ± 0.044
Albumin (g/ dl)	2.98 ± 0.131	3.09 ± 0.086	3.14 ± 0.100	3.36 ± 0.036	3.15 ± 0.050
Albumin/ Globulin Ratio	0.78 ± 0.059	0.79 ± 0.038	0.80 ± 0.046	0.91 ± 0.038	0.82 ± 0.024
Cholesterol (mg/ dl)	91.08 ± 0.875[a]	95.83 ± 1.815[a,b]	94.71 ± 1.325[a]	101.64 ± 1.303[b]	95.81 ± 0.896
Calcium (mg/ dl)	8.48 ± 0.114	8.52 ± 0.138	8.50 ± 0.139	8.83 ± 0.133	8.58 ± 0.067
Phosphorus (mg/ dl)	4.44 ± 0.079[a]	4.52 ± 0.073[a]	4.79 ± 0.089[a,b]	4.96 ± 0.119[b]	4.68 ± 0.055

Values with different superscripts in a row differ significantly: (P<0.05).

the preservation of cultivated landscape. Thus the present investigation was done to assess the nutritional status of cattle of farmers in different landholding capacities under field conditions.

The study was conducted in Sultanpur district of Uttar Pradesh, India. Farmers were selected on the basis of stratified random design for the present investigation from the 30 villages of 10 blocks in 5 tehsils. The animals were grouped in to four categories depending on the land holding capacity of the farmers viz. landless (Livestock owners who had nil land and whose mode of survival was labour), marginal (Livestock owners who had land up to 1.0 ha), small (Livestock owners who had land in between 1.0 to 2.0 ha) and large (Livestock owners who had land above 2.0 ha).

A total of 441 lactating cattle were selected for recording of Body Weight and Body Condition Scores (BCS). Out of 441 animals; 85 belonged to landless farmers, 137 to marginal farmers, 165 to small farmers and 54 to large farmers. The body weights of the individual animals were calculated by using Minnesota formula (Verma 1992). Body condition of the animals was scored from 1 to 9 based on the criteria set by Richard *et al.* (1986).

For the analysis of blood metabolites, 30 animals from each category were selected randomly. Five to ten ml of blood from jugular vein was collected from each animal. The blood was transported to the laboratory in ice, where serum was collected and stored at -20C till further analysis. From the serum samples, Glucose, Total Protein, Cholesterol, Albumin, Calcium and Phosphorus were measured using commercially available kits (Span Diagnostics). Data thus generated were analyzed statistically using Graph Pad Instat version 5.00 software.

The body weight (BW), Body condition scores (BCS) and blood metabolites of cattle in different categories of farmers is represented in the Table 1.

The results of the study showed a significant difference (P<0.05) of body weights of cattle of landless category to all other category of farmers. Difference between marginal and small category was not significant. The BCS of cattle differed significantly (P<0.05) among all category of farmers. These findings of body weights and BCS in present study are in concurrence with the studies of Chantalakhana *et al.* (1984), Lanyasunya *et al.* (2006). Contrary to the present observation, lower body weights of cattle of Kashmir valley of India was reported by Bhat *et al.* (2013). The significant difference in the body weight and BCS of cattle in different categories of farmers may be attributed to the difference in breeds.

The non significant (P0.05) differences in glucose level between groups may be due to non-consideration of stage of lactation, milk yield, age, herd origin etc (Lee *et al.* 1978). Similar findings was also reported by Maurya and Singh (2015) in Indian buffaloes, where they reported that blood glucose levels were within normal range and also did not differed significantly in all groups of farmers. Blood glucose in ruminants is contributed partly by direct absorption through GIT and partly through gluconeogenesis from propionate (Kaneko *et al.* 1997). The glucose level may be associated with the nature and frequency of feeding (Ramakrishna 2003) of dry fodders.

The levels of blood glucose, serum total protein, serum albumin, albumin/globulin ratio and calcium of cattle did not showed any significant difference (P<0.05) among different categories of farmers.

However serum cholesterol and inorganic phosphorus levels in cattle showed significant difference (P<0.05) between landless and large and small and large categories of farmers and levels of these did not differ significantly (P≥0.05) in cattle of other categories of farmers.

The blood biochemical profiles in the present investigation were in close agreement with the reports of Bertoni *et al.* (1994) and Cardoso *et al.* (2008). However higher values of serum cholesterol (125.95 mg/ dl to 142.13 mg/dl) was reported in Indian lactating buffaloes by Balusami *et al.* (2008). This difference could be attributed to the age of animals, as animals of higher age show more cholesterol values.

The finding of lower serum calcium and phosphorus in the present investigation is in concurrence with the studies of Gowda *et al.* (2008) who reported a serum calcium level of 9.66 ± 0.21 mg/dl (calcium) and 2.86 ± 0.10 mg/dl (phosphorus) in dairy cows under field conditions.

In the dairy industry, the use of metabolic profiles for assessing the nutritional and health status of cows is widespread (Doornenbal *et al.* 1988; Grunwaldt *et al.* 2005). Use of such metabolites in the management of field cattle is still uncommon. The success of metabolic profile test alone is limited because several non-dietary factors like herd origin, stage of lactation, milk yield and season of the year affect the concentration of blood metabolites (Lee *et al.* 1978). But the blood biochemical profile along with the consideration of body weights and body condition scores can be used for assessment of nutritional and health conditions of livestock (Maurya and Singh 2015).

Based on the present findings, it can be concluded that dairy cows of unorganized farmers of this area in Sultanpur district of Uttar Pradesh are deficit in minerals calcium and inorganic phosphorus; that might affect their further performance. The blood biochemical profiles along with traditional methods like body weights and BCS can be used for assessment of nutritional status.

REFERENCES

Balusami, C., Sivakumar, T. and Akila, N. 2008. A study on blood biochemical profiles of lactating buffaloes. *Ind. Vet. J.*, **85**: 1011-1012.

Bertoni, G., Lombardeli, R., Piccioli Cappelli, F., Bartocci, S. and Amici, A. 1994. Alcuni fattori che influenzano le condizioni endocrino-metaboliche della specie bufalina. *Agr. Ricerca.*, **16**: 87-98.

Bhat, S.H., Medhi, D., Ahmed, H.A. and Matto, F.A. 2013. Nutritional status of dairy cattle in the North-Western Himalayan region of the Kashmir valley. *Iran. J. App. Anim. Sci.,* **3**(1): 31-37.

Cardoso, F.C. de, Esteves, V.S., Oliveira, S.T. de, Lasta, C.S., Valle, S.F., Campos, R. and Gonzalez, F.H.D. 2008. Hematological, biochemical and ruminant parameters for diagnosis of left displacement of abomasums in dairy cows from Southern Brazil. *Pesq. Agropec. Bras.*, **43**(1): 141-147.

Chantalakhana, P., Bunavelchevin and Veerasit, P. 1984. Effect of seasonal fluctuations and parturition on body weight of swamp buffalo. *Buff. Bull.*, **3**(3): 3-7.

Doornenbal, H., Tong, A.K.W. and Murray, N.L. 1988. Reference values of blood parameters in beef cattle of different ages and stages of lactation. *Can. J. Vet. Res.*, **52**: 99–105.

Gowda, N.K.S., Prasad, C.S., Selvaraju, S., Reddy, I.J., Anantham, R. and Sampath, K.T. 2008. Feeding practices and nutrient status of dairy cows under field conditions. *Ind. Vet. J.*, **85(7)**: 745- 748.

Grunwaldt, E.G., Guevara, J.C., Estevez, O.R., Vicente, A., Rousselle, H., Alcunten, N., Aguerregaray, D. and Stasi, C.R. 2005. Biochemical and haematological measurements in beef cattle in Mendoza plain rangelands (Agerntina). *Trop. Anim. Hlth. Prod.*, **37**(6): 527-40.

Kaneko, J.J., Harvey, J.W. and Bruss, M.L. 1997. Clinical biochemistry of domestic animals. 5th edition. Academic Press, New York, 890-894.

Lanyasunya, T.P., Rong, W.H., Mukisira, E.A. and Abdulrazak, S.A. 2006. Performance of dairy cows in different livestock production systems on smallholder farms in Bahati Division, Nakuru District, Kenya. *Pak. J. Nutr.*, **5**(2): 130-34.

Larsen, T., Moller, G. and Bellio, R. 2001. Evaluation of clinical and clinical chemical parameters in periparturient cows. *J. Dairy Sci.*, **84:** 1749-1758.

Lee, A.J., Twardock, A.R., Bubar, R.A., Hall, J.E. and Davis, C.L. 1978. Blood metabolic profiles: their use and relation to nutritional status of dairy cows. *J. Dairy Sci.*, **61**: 1652-70.

Martens, H. and Schweigel, M. 2000. Pathophysiology of grass tetany and other hypo magnesemias. Implication for clinical management. *Vet. Clin. North Am. Food Anim. Pract.*, **16**: 339-368.

Maurya, S.K. and Singh, O.P. 2015. Assessment of blood biochemical profile and nutritional status of buffaloes under field conditions. *Buff. Bull.,* **34**(2): 161-167.

Moddie, E.W. 1965. Hypocalcaemia and hypomagnesaemia. *Br. Vet. J.,* **121**: 338-342.

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

Ramakrishna, K.V. 2003. Studies on blood chemical constituents of cross bred jersey cows maintained under varied nutritional managements. *Ind. Vet. J.*, **80:** 698-699.

Richards, M.W., Spitzer, J.C. and Warner, M.B. 1986. Effect of varying levels of postpartum nutrition and body condition at calving on subsequent reproductive performance in beef cattle. *J. Anim. Sci.*, **62:** 300-06.

Verma, D.N. 1992. Cow Keeping and Management, 1st edition. JBD Publishing House, New Delhi, 45-50.