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Effect of molasses based multi nutrients liquid supplement on haematological and hormonal profile in male buffalo calves (*Bubalus bubalis*)

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Abstract
An experiment was conducted to study the effects of molasses based multi nutrients liquid supplement on the haematological and hormonal assay in male buffalo calves. A total of 21 male buffalo calves (6-8 Months age) were randomly divided into 3 groups (C, T_1 and T_2). All groups received the same standard concentrate mixture viz. CM-I but concentrate to roughage ratio was 60:40, 50:50 and 40:60 in groups C, T_1 and T_2 respectively and additional MMLS was provided in T_1 and T_2 groups @ 5% and 10% DMI respectively. At 0 day and 90 day blood samples were collected from the jugular vein and analyzed haematological and hormonal profile. The serum insulin (µIU/ml) concentration was highly significant ($P<0.001$) and T3 concentration was significantly differ ($P<0.05$) at 0 day and 90 day. No significance ($P>0.05$) were found in Hb (g/dl), PCV (%), WBC, RBC and serum T4 levels of experimental calves irrespective of dietary treatments and periods.

Keywords: Buffalo calves, molasses, haematology, hormonal profile

Introduction
Livestock farming is important for animal-based food products and as a source of income for many resource-poor farmers in developing countries. With the increase in human population and economic growth the demand for livestock products also increase. As per 19th livestock census buffalo population in India is around 97.92 million [1]. However, the main constraint of livestock development in our countries is the scarcity and fluctuation in the quality and quantity of animal feed supply around the year. Buffaloes contribute significantly as the main livestock species for milk and meat production. Molasses is the main byproduct of the sugarcane and is suitable source of energy. These are suitable way of supplying readily fermentable energy (glucose) to ruminants. Molasses based multi-nutient liquid supplement is low-cost technology and has great potential to enhance the nutrition of ruminant livestock and improve animal productivity.

Haematological and hormonal profiles reflect the health status of the animals. Insulin involves in direct control of cellular uptake of glucose and certain amino acids and indirect uptake of fatty acid. It directly regulates trasporter protein (Glut-1 and Glut-4 protein), promotes lipogenesis and inhibits lipolysis. Thyroid hormones are metabolic hormones required to the neonates to build up their immune competence along with other homeostatic activities. Triiodothyronine (T3) and thyroxine (T4) increase oxygen consumption and heat production to a large extent by stimulating Na+, K+ -ATPase in all tissues except brain, spleen and testis. T3 is physiologically more active than T4 and provides a better indication of the metabolic status of the animal [2]. These hormones regulate calorigenesis, basal metabolic rate (BMR), [3] growth, maturation as well as lipid and carbohydrate metabolism. They also affect cardiovascular, neuromuscular, gastrointestinal, reproductive, immunological, haematological and endocrine functions of the animals. The steroidal hormone, cortisol increase blood sugar through gluconeogenesis and is used to quantify stress [4].

Considering the above facts the present experiment was conducted to study the effect of molasses based multi nutrients liquid supplement on the haematological and hormonal profile in male buffalo calves (*Bubalus bubalis*).

Materials and Methods
This experiment was carried out in the experimental animal shed, Division of Animal Nutrition,

Indian Veterinary Research Institute, Izatnagar, Bareilly, UP - 243122. All procedures followed in this experiment were approved by the Committee on Protocol, Control and Supervision of Experimentation on Animals (CPCSEA), New Delhi, India. A total of 21 male buffalo calves of 6-8 Months age were taken for this study. Animals were housed in well-ventilated shed with facilities for individual feeding under hygienic and uniform management conditions. All animals were provided fresh and clean drinking water twice daily. Calves were divided into 3 groups having 7 calves in each group in a randomized block design (RBD). Calves of the control group (C) were fed a standard diet to meet their requirements for an ADG of 500 g (ICAR, 2013) [5]. The experimental buffalo calves were fed standard concentrate mixture viz. CM-I. The composition of CM-I was same for all three groups, however concentrate to roughage ratio was 60:40, 50:50 and 40:60 in groups C, T_1 and T_2 respectively and additional MMLS was provided in T_1 and T_2 groups @ 5% and 10% DMI respectively. Available green fodder was given to supply 0.5-1.0 kg DM/animal/day to meet out carotene/Vitamin A requirements whereas wheat straw was given *ad libitum*. Blood was collected from all the experimental animals at 0day and 90 day of the experimental period. Blood samples were collected from the jugular vein and brought to the laboratory without disturbing clots and centrifuged at 3000 rpm for 15 mins to collect serum and stored at -20 ^{0}C in small plastic eppendorf tubes for further analysis. Haemoglobin (Hb) and Packed Cell Volume (PCV) were analyzed on the day of collection. Total count of red blood corpuscle (RBC), white blood corpuscle (WBC), PCV and Hb were done by using Haemoanalyzer (Nihon Khoden, Japan). The serum samples were analysed for insulin, T3, T4 and cortisol using commercial kits.

Data were analyzed by using IBM- SPSS version 20. Two way ANOVA was used for comparison of means according to Duncans multiple range test at 5% level of significance.

Results and Discussion

Haematological parameters

The haematological parameters including Hb, PCV, RBC and WBC are presented in Table 1. Mean Hb and PCV levels under different treatments ranged from 12.56 to 13.36 g/dl and 31.86 to 34.38% respectively. Non-significant difference (P>0.05) is found in Hb (g/dl) and PCV (%) levels of experimental calves irrespective of dietary treatments and periods. Blood haemoglobin and PCV are the indicators of erythrocytic level and well-being of animals. The mean values of Hb (g/dl) and PCV (%) are comparable among the different dietary treatments by supplementing molasses based multi-nutrients and chromium picolinate in lactating murrah buffaloes diet [6]. The RBC and WBC count was also similar among all groups with comparable overall periodic mean among the groups. The RBC values were varied from 5.73 to 5.93 (10^6/µl**)** and WBC values varied from 9.02 to 9.26 (10^3/µl). Non-significant difference (P>0.05) is found in RBC and WBC levels of experimental calves irrespective of dietary treatments and periods. Significantly (P<0.05) higher Haemoglobin concentration and PCV (%) in urea molasses block supplemented group as compared to the control group [7]. Significantly (P<0.05) increased number of Hb, RBC and WBC in urea molasses multi-nutrient block supplemented group as compared to control group [8].

Table 1: Effects of molasses based multi nutrients liquid supplement on haematological profile in male buffalo calves

Particulars	Treatment	0 day	90 day	Mean ± SE	P value		
					T	P	TXP
Haemoglobin (g/dl)	C	12.20±0.15	12.63±0.21	12.41±0.09	0.19	0.06	0.79
	T_1	12.86±0.14	13.70±0.25	13.28±0.10			
	T_2	12.63±0.17	13.74±0.22	13.19±0.10			
	Mean ± SE	12.56±0.05	13.36±0.08				
PCV (%)	C	30.57±0.53	32.00±0.71	31.29±0.31	0.23	0.09	0.82
	T_1	32.86±0.48	35.29±1.02	34.07±0.39			
	T_2	32.14±0.55	35.86±0.70	34.00±0.33			
	Mean ± SE	31.86±0.17	34.38±0.27				
RBC(10^6/µl)	C	5.98±0.09	5.73±0.15	5.86±0.10	0.67	0.72	0.96
	T_1	5.93±0.16	5.75±0.29	5.84±0.15			
	T_2	5.90±0.10	5.73±0.30	5.82±0.10			
	Mean ± SE	5.93±0.08	5.74±0.16				
WBC(10^3/µl)	C	9.11±0.24	9.02±0.23	9.07±0.14	0.88	0.85	0.93
	T_1	9.14±0.13	9.16±0.16	9.15±0.19			
	T_2	9.20±0.26	9.12±0.24	9.16±0.16			
	Mean ± SE	9.15±0.12	9.10±0.11				

Hormonal profile

The concentration of serum T3 (ng/ml), T4 (nmol/l), cortisol (nmol/L) and insulin (µIU/ml) values is presented in Table 2. Serum T3 and T4 varied from 4.06 to 7.14(ng/ml) and 133.18 to 169.25(nmol/l) respectively. Serum T3 (ng/ml) concentration showed significant differerence (P<0.05) at 0 day and 90 day but No significance (P>0.05) was found in serum T4 (nmol/l) concentration of experimental calves irrespective of dietary treatments and periods. Thyroid hormones control many physiological functions including cellular metabolism [9]. Thus the serum T3 and T4 concentrations seem to be significantly related to the growth and age of the animal. Triiodothyronine (T3) and Thyroxin (T4) values were significantly (P<0.05) higher while molasses were supplemented in the diet of Sahiwal and Karan Fries Heifers [10].

Table 2: Effects of molasses based multi nutrients liquid supplement on hormonal profiles in male buffalo calves

Particulars	Treatment	0 day	90 day	Mean ± SE	P value		
					T	P	TXP
T3 (ng/ml)	C	7.14±0.46	6.14±0.96	6.64±0.53	0.13	0.04	0.76
	T_1	6.11±0.98	4.06±0.40	5.09±0.58			
	T_2	6.87±0.96	5.79±0.71	6.33±0.59			
	Mean ± SE	6.70^{a}±0.47	5.33^{b}±0.45				
T4 (nmol/l)	C	169.25±21.58	142.55±19.11	155.90±14.33	0.64	0.96	0.46
	T_1	133.18±19.04	152.43±16.75	142.81±12.47			
	T_2	157.28±10.32	162.50±22.84	159.89±12.06			
	Mean ± SE	153.24±10.23	152.49±10.96				
Cortisol (nmol/L)	C	53.12±4.34	52.06±4.32	52.59±3.34	0.31	0.12	0.28
	T_1	50.23±3.32	53.14±2.43	51.69±2.83			
	T_2	52.14±4.14	50.25±3.52	51.20±3.18			
	Mean ± SE	51.83± 2.12	51.82±2.33	51.83±3.01			
Insulin(µIU/ml)	C	14.10±1.09	33.62±4.74	23.86±3.58	0.28	0.00	0.21
	T_1	14.19±2.92	27.03±5.13	20.61±3.35			
	T_2	14.80±3.03	21.00±3.67	17.90±2.45			
	Mean ± SE	14.36^{b}±1.38	27.22^{a}±2.75				

*[abc] Mean values with different superscripts within row differ significantly.

The concentration of cortisol varied from 50.20 to 53.14 (nmol/L) and did not significantly differ at 0 day and 90 day irrespective of dietary treatment. The mean concentration of serum insulin is comparable among all groups and significantly differ (P<0.001) at 0 day and 90 day. Significantly higher insulin concentration in urea molasses multi nutrient block fed group indicating that it can utilize glucose better than non-fed group [11]. Mean values of insulin, T3, T4 and cortisol were comparable among different dietary treatments by supplementing the diet with molasses based multi-nutrients and chromium picolinate in lactating murrah buffaloes [12].

Conclusion

From the results of the present findings it is concluded that haematological and hormonal profiles other than tri-iodothyronine (T3) and insulin were not influence by supplementation of molasses based liquid mineral mixture in growing male buffalo calves.

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