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Effect of Molasses Based Multinutrients and Chromium Supplementation on the Haematological and Blood Biochemical Profile in Lactating Murrah Buffaloes

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ABSTRACT

A study was conducted to assess the effect of molasses based multi-nutrients and chromium Picolinate supplementation on the haematological and blood biochemical profile in lactating murrah buffaloes. Thus, twenty eight lactating Murrah buffaloes were equally divided into four groups of 7 each. Basal diet consisting wheat straw, maize green and concentrate mixture were fed to all groups. In addition to basal diet, the animals of group T_2 fed 250 g molasses based multinutrient supplement (MMS), group T_3 fed 5 mg Chromium picolinate and group T_4 fed with 250 g MMS plus 5 mg Chromium picolinate. All the diets were iso-nitrogenous and were formulated to meet the nutrient requirement lactating buffaloes. The study was conducted for 210 days. Blood was collected at 0, 90 and 180 days of experimental feeding to harvest the serum and serum biochemical parameters were analyzed using standard protocol. The mean values for Hb (mg/dl), globulin(g/dl), A:G ratio, glucose (mg/dl), total protein (g/dl), SGOT (IU/L), SGPT (IU/L), PCV (%), WBC(10^3/ul) and platelet(10^3/ul) count was comparable among the different dietary treatments while albumin (g/dl) and blood urea (mg/dl) were differ significantly ($P<0.05$). Periodical significant ($P<0.05$) higher values were also observed on the mean values of Hb, globulin, A:G ratio, blood urea at 90 and 180 days of post-feeding but it was comparable and lies in the normal physiological range. It is concluded that the inclusion of MMS and chromium supplementation influenced the blood biochemical profile (albumin and blood urea) and did not have any adverse effects on the health of lactating Murrah buffaloes in long term feeding.

Keywords: MMS, Murrah buffaloes, chromium picolinate, blood biochemicals

In India livestock mainly subsist on poor quality feeds and fodder that are deficient in energy, protein, mineral and vitamin. As a result, performance of animal is often sub-optimal that is reflected in stunted growth, delayed maturity, longer inter-calving period and poor milk yield. Dietary supplementation of critical nutrients can improve the utilization of poor quality roughages. Considering the availability and price of concentrate mixture, resource poor farmers can hardly afford them. One of the main focuses of animal nutrition research in this country is to improve nutritive value of cereal straws through strategic supplements that are also cheaper as compared to grains and oilseed meals. Use of NPN substances like urea was tried to replace the costly source of proteins in ruminant diet. Molasses/urea is a suitable way of supplying degradable protein and fermentable energy (Paviz *et al.,* 2011). Urea molasses mineral supplement is an alternative feed resource has been advocated as a panacea to protein and energy deficiency in ruminants especially during dry season (Aye, 2012). Supplementation of urea molasses mineral block (UMMB) can show promising results in improving the nutrient utilization and also the productivity of animals (Prasad *et al*., 2001). Mineral deficiency in grazing ruminants has been reported by several authors (Gowda *et al.*, 2004; Khan *et al*., 2007) and supplementation is one way of tackling this problem. In present study chromium has been also supplemented as it regulates carbohydrate metabolism as a structural component of glucose tolerance factor (GTF) (Rosebrough and Steele, 1981; Mertz, 1993) which increases the absorption of glucose from circulation

into peripheral tissues (Anderson, 1987). In India, studies on supplementation of molasses based mutinutrient (MMS) containing chromium for buffaloes and its effect on blood biochemical parameters are limited. Hence, the present study was conducted to find out the effect of MMS and chromium Picolinate on haematological and blood biochemical profile of lactating Murrah buffaloes.

MATERIALS AND METHODS

The protocol for this experiment was approved and buffaloes were cared according to the guidelines of the Institutional Animal Care and Use Committee of Indian Veterinary Research Institute, Izatnagar, Bareilly, (UP), India.

Animals and experimental design

28 healthy dairy buffaloes were selected and randomly allocated into four groups (n=7) on the basis of milk yield and body weight (560±10.0 kg). Experimental buffaloes Feeding regimen was same in all the groups except the buffaloes in the treatment groups were additionally supplemented with 250 gm molasses based multinutrient (MMS-1), 5 mg Chromium (Cr) and 250 gm MMS + 5 mg Cr (MMS-2) in T2, T3 and T4 groups respectively. The physical composition of MMS-1 and MMS-2 was same except addition of 2 gm chromium per 100 kg of supplement. Physical composition of MMS was molasses (40%), urea (5%), Deoiled Mahua Seed Cake (10%), Wheat bran (20%), Crushed maize (20%), Mineral Mixture (4%) and Salt (1%). Both the diets were made iso-nitrogenous and were formulated to meet the requirement of buffaloes as per ICAR (2013).

All the experimental buffalo were fed on a basal diet comprised of concentrate mixture, maize green fodder and wheat straw. All the animals were dewormed and vaccinated before the onset of the experiment. The experiment was conducted for 210 days. Blood was collected at 0, 90 and 180 days of experimental trial by jugular vein puncture and serum was collected and then stored at -20°C until further analysis. Serum was analysed after thawing for various biochemical and enzymatic profile by standard protocol using commercial diagnostic kit.

Statistical analysis

The experimental data generated were analysed using statistical package SPSS (20.0) adopting standard statistical procedures (Snedecor and Cochran, 1994). Data pertaining hematology and biochemical parameters were subjected to general linear model (GLM) - multivariate analysis to separate the effect of treatment, day of sampling and their interaction. Significance was declared at $P<0.05$ and $P<0.01$ levels. Significant differences were separated using Duncan's test.

RESULTS AND DISCUSSION

The result of hematological and biochemical blood parameters in lactating Murrah buffaloes has been presented in Table 1 and 2. Blood haemoglobin (Hb) is an indicator of erythrocytic normal level and general well beings of animals. The Hb values varied from 9.59 to 10.60 g/dl across different treatments and comparable. However, Significantly ($P<0.05$) higher changes in the hemoglobin concentration could be noticed at 90 d and 120 days of post feeding but it was comparable and within the normal physiological range range (Kaneko, 2008). The result was in correlation with Aye (2013) on feeding *Cnidoscolus aconitifolius* based urea multi nutrient block of West African dwarf goat. Deka *et al.* (2015) observed that Cr supplementation did not have any effect on Hb in lactating Murrah buffaloes that was consistent with the results of Khalili *et al.* (2011) and Agustin *et al.* (2012) who also found no effect of Cr supplementation on blood hematology. Perusal of table revealed that PCV, RBC, WBC and platelet did not differ significantly among the groups and were in the normal physiological range (Kaneko, 2008).

Mean serum glucose were non significantly differ among the groups. Similar to this Kegley *et al.* (1997) also found no effect of Cr supplementation on plasma glucose concentration in cattle; however, reports by Chang *et al.* (1996) and Stahlhut *et al.* (2006) demonstrated that Cr supplementation lowered plasma glucose concentration in growing and finishing steers.

In the present study, serum total proteins remained within normal range and did not differ significantly ($P>0.05$) among different dietary treatments. This indicates that experimental feeds had no deleterious effect on serum

Table 1: Haematological parameters of lactating Murrah buffaloes in different groups

Particulars	Treatment ŧ	0 Day	90 Day	180 Day	Mean	SEM	T	P	T*P
Hb (g/dl)	T_1 (control)	9.45±0.566	9.96±0.87	9.36±0.70	9.59±0.39	0.195	0.228	0.020	0.661
	T_2	9.08±0.68	11.69±0.80	11.02±0.60	10.60±0.48				
	T_3	9.22±0.61	10.20±0.80	10.58±0.62	10.00±0.40				
	T_4	9.78±0.49	10.80±0.80	11.03±0.40	10.54±0.35				
	Mean	9.38^{A}±0.28	10.66^{B}±0.41	10.50^{B}±0.31					
PCV (%)	T_1 (control)	36.44±2.23	35.47±2.02	35.82±1.85	35.91±1.10	0.674	0.732	0.989	0.998
	T_2	37.68±2.47	38.06±1.38	37.55±1.47	37.77±0.99				
	T_3	35.69±2.25	35.30±3.06	36.63±1.85	35.87±1.31				
	T_4	36.79±2.74	37.03±3.57	35.67±2.15	36.50±1.55				
	Mean	36.65±1.13	36.47±1.24	36.42±0.86					
RBC (10^6/ul)	T_1 (control)	5.70±0.57	5.67±0.59	6.08±0.60	5.82^{a}±0.32	0.133	0.013	0.095	0.595
	T_2	6.01±0.36	7.69±0.56	7.42±0.38	7.04^{b}±0.31				
	T_3	5.92±0.36	6.03±0.51	6.22±0.33	6.06^{a}±0.22				
	T_4	5.94±0.36	6.25±0.49	6.62±0.21	6.27^{a}±0.21				
	Mean	5.89±0.20	6.41±0.30	6.59±0.22					
WBC (10^3 /µl)	T_1 (control)	11.85±0.69	11.64±0.65	11.77±1.01	11.75±0.43	0.190	0.816	0.766	0.969
	T_2	12.19±0.52	11.86±0.46	12.52±0.82	12.19±0.34				
	T_3	12.34±0.34	12.08±0.38	11.44±0.88	11.95±0.33				
	T_4	12.02±0.37	11.51±0.67	11.68±0.71	11.73±0.33				
	Mean	12.10±0.23	11.77±0.26	11.85±0.41					
Platelets (10^3 /µl)	T_1 (control)	221.4±13.71	220.6±16.93	219.6±17.83	220.5±8.69	4.24	0.994	0.994	1.00
	T_2	222.2±16.63	223.4±18.81	222.6±9.23	222.7±8.26				
	T_3	219.6±14.80	221.6±11.10	217.2±13.37	219.5±7.06				
	T_4	219.4±2.94	220.0±20.53	221.8±11.18	220.4±7.28				
	MEAN	220.7±6.04	221.4±7.90	220.3±6.12					

^{AB} Mean values with different superscripts within a row differ significantly (P<0.05)

^{ab}Mean values with different superscripts within a column differ significantly (P<0.05)

ŧ Animals in group T1 fed a basal diet only; in group T2 fed basal diet + MMS-1; in group T3 fed basal diet + 5 mg chromium and in group T4 fed basal diet + MMS-2

Table 2: Blood biochemical profile of lactating Murrah buffaloes in different groups

Particulars	Treatment ŧ	0 Day	90 Day	180 Day	Mean	SEM	T	P	T*P
Glucose(mg/dl)	T_1 (control)	58.38±3.58	58.01±2.12	56.66±2.48	57.69±1.51	1.05	0.086	0.754	0.833
	T_2	58.36±4.77	54.16±1.87	58.97±2.80	57.16±1.89				
	T_3	60.07±5.15	64.42±4.02	63.24±5.08	62.58±2.60				
	T_4	59.80±4.80	64.76±2.08	65.45±2.49	63.34±1.91				
	Mean	59.15±2.12	60.34±1.60	61.08±1.75					
Total protein(g/dl)	T_1 (control)	7.15±0.50	7.86±0.20	7.68±0.13	7.56±0.19	0.083	0.061	0.212	0.847
	T_2	7.31±0.41	7.52±0.26	7.81±0.24	7.54±0.18				
	T_3	7.39±0.30	7.48±0.30	7.70±0.18	7.52±0.15				
	T_4	8.03±0.31	8.20±0.10	7.99±0.249	8.08±0.13				
	Mean	7.47±0.19	7.77±0.13	7.80±0.10					
Albumin (g/dl)	T_1 (control)	4.19±0.13	4.05±0.06	4.14±0.12	4.12^{a}±0.06	0.027	0.013	0.276	0.406
	T_2	4.22±0.09	4.17±0.11	4.17±0.05	4.19^{ab}±0.05				
	T_3	3.99±0.08	4.11±0.05	4.01±0.08	4.04^{a}±0.04				
	T_4	4.49±0.10	4.18±0.04	4.21±0.15	4.29^{b}±0.07				
	Mean	4.22±0.06	4.13±0.03	4.13±0.05					
Globulin (g/dl)	T_1 (control)	2.96±0.41	3.81±0.17	3.55±0.10	3.44±0.17	0.077	0.234	0.053	0.696
	T_2	3.08±0.42	3.35±0.25	3.64±0.25	3.35±0.18				
	T_3	3.39±0.34	3.37±0.29	3.69±0.15	3.48±0.15				
	T_4	3.54±0.32	4.03±0.07	3.78±0.14	3.78±0.12				
	Mean	3.24^{A}±0.18	3.64^{B}±0.12	3.67^{B}±0.08					
A:G ratio	T_1 (control)	1.54±0.22	1.07±0.05	1.17±0.05	1.26±0.09	0.036	0.431	0.010	0.563
	T_2	1.49±0.22	1.27±0.10	1.17±0.09	1.31±0.09				
	T_3	1.23±0.14	1.27±0.15	1.09±0.05	1.20±0.07				
	T_4	1.31±0.13	1.04±0.02	1.12±0.04	1.16±0.05				
	Mean	1.39^{B}±0.09	1.16^{A}±0.05	1.14^{A}±0.03					
Blood urea (mg/dl)	T_1 (control)	10.13±1.42	10.69±0.49	10.32±0.37	10.38^{a}±0.48	0.178	0.001	0.001	0.06
	T_2	9.80±0.49	13.07±0.18	12.81±0.19	11.90^{b}±0.43				
	T_3	9.78±0.99	10.54±0.57	9.83±0.68	10.05^{a}±0.42				
	T_4	10.00±0.19	13.19±0.14	13.07±0.20	12.09^{b}±0.41				
	Mean	9.93^{a}±0.42	11.87^{b}±0.34	11.51^{b}±0.38					
SGOT (IU/L)	T_1 (control)	91.83±5.91	90.71±2.74	91.30±4.44	91.28±2.44	1.76	0.933	0.935	1.00
	T_2	93.32±8.35	93.05±5.36	91.24±5.97	92.54±3.58				
	T_3	91.63±7.16	90.12±5.78	88.96±7.02	90.24±3.58				
	T_4	93.65±8.37	93.52±4.13	92.59±5.47	93.25±3.34				
	Mean	92.61±3.45	91.85±2.16	91.02±2.68					
SGPT(IU/L)	T_1 (control)	19.57±1.52	20.03±1.91	17.42±1.81	19.01±0.99	0.584	0.976	0.884	0.810
	T_2	19.52±1.78	18.16±2.44	19.32±1.95	19.00±1.12				
	T_3	18.17±1.82	20.45±3.30	20.33±1.85	19.65±1.33				
	T_4	17.98±2.59	18.58±0.96	20.93±1.28	19.16±1.00				
	Mean	18.81±0.84	19.30±1.07	19.50±0.82					

^{AB} Mean values with different superscripts within a row differ significantly (P<0.05),(P<0.01)

^{ab} Mean values with different superscripts within a column differ significantly (P<0.05), (P<0.01)

ŧ Animals in group T1 fed a basal diet only; in group T2 fed basal diet + MMS-1; in group T3 fed basal diet + 5 mg chromium and in group T4 fed basal diet + MMS-2

proteins. However, the albumin, globulin and A:G ratio differs significantly. Similar results were also observed by Kang (2002) and Randhawa *et al*. (2003b). Conversely Al-Saiady *et al*. (2004) did not find any change in the albumin level in Holstein cows supplemented with chelated Cr. Furthermore they reported that adding chromium to the diet of lactating cows did not show any effect on level of albumin and glucose while concentration of total blood protein and globulin was decreased. The ratio of albumin/ globulin increased significantly by adding chromium ($P < 0.01$).

The mean serum urea varied from 10.05 to 12.09 mg/ dl across different treatments and was statically differ significantly (P>0.01). This corroborates well with the findings of Choubey *et al*. (2015) and Wadhwa and Bakshi (2014) also found BUN concentration significantly higher (P<0.05) in all the groups (43.6 to 55.6 mg/dl) supplemented with UMMB. However, contrary results were obtained by Raman *et al.* (2010) and this may be attributed to low consumption of UMMB and slow release of NH3. Furthermore, no effect of chromium supplementation on urea nitrogen and total protein was observed in any of the other trials (Ohh and Lee, 2005; Sung *et al.,* 2015). Similar results were reported by Kitchalong *et al.* (1995) in lambs and Bunting *et al.* (1994) in steers with Cr-picolinate.

There was no variation in the activity of SGPT/ and SGOT among the treatments across various time intervals in treatments T1, T2, T3 and T4, respectively, which was in corroboration with Cenesiz *et al*. (2006) who reported no effect of urea molasses supplementation on the activity of SGPT and SGOT in lambs. However, Hossain *et al*. (2011) reported that SGOT and SGPT values increased significantly by using urea molasses mineral block supplement, Tiwari *et al*. (2010) also found similar observation in goat kids. The activity of SGOT and SGPT is an indicator of damage to liver and muscles (Silanikove *et al.,* 1996; Casteel, 1999). In our experiment the level of SGPT and SGOT were comparable to that of the control group, depicting that supplementation of MMS and chromium has no harmful and degenerative effect on hepatic cells and muscle tissues.

CONCLUSION

From the results of the present findings, it is concluded that the blood biochemical parameters were influenced by supplementation of molasses based multinutrients and chromium and supplementation did not have any adverse effects on the health of lactating Murrah buffaloes.

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