International Journal of General Medicine
and Pharmacy (IJGMP)
ISSN(P): 2319-3999; ISSN(E): 2319-4006
Vol. 5, Issue 3, Apr - May 2016, 13-18

International Academy of Science,
Engineering and Technology
Connecting Researchers; Nurturing Innovations

EFFECT OF DEFICIENT MINERAL SUPPLEMENTATION ON BLOOD METABOLITES IN PRE-PARTUM BLACK BENGAL DOES

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ABSTRACT

Eighteen healthy 1st parity, non-pregnant Black Bengal does were taken on the basis of body weight in the experimental goat farm, ERS-IVRI, Kalyani, West Bengal. Goats were reared under semi-intensive management. They were allowed to graze 6-7 h along with supplementation of concentrate @ 300 g/day/animal. Goats were divided into three groups *viz.* Group I, II and III supplemented with 0%, 2% CMM and 2% ASMS, respectively. Animals were mated and necessary blood samples were taken study the different blood metabolites during pregnancy stage at monthly interval. Overall Mean NEFA level in group I, II and III was 0.244±0.026, 0.245±0.056 and 0.237±0.028 mmol/L respectively. NEFA level differed significantly (P<0.05) among different groups. Overall Mean SGPT level in group I, II and III was 33.47±2.4, 36.45±3.32 and 34.89±3.10 IU/l respectively. Overall Mean Estrogen level in group I, II and III was 98.45±4.21, 110.94±4.32 and 105.87±3.27 pg/ml respectively. Estrogen level increased significantly (P<0.05) in supplemented groups. Overall Mean Progesterone level in group I, II and III was 7.08±1.42, 8.89±1.62 and 8.56±1.84 ng/ml respectively.

KEYWORDS: Black Bengal Goats, Pre-Partum, Blood Metabolites, Area Specific Mineral Supplements

INTRODUCTION

Black Bengal is one of the handpicked Indian goat breed and famous for its prolificacy, testiest meat and finest skin. It portrayed as travelers cheque for landless and marginal farmers. Goats are hardier, multi-utility, easy-to-maintain and prolific animals that can efficiently convert low-value vegetation, tree leaves and crop residues into high value meat, milk, hide and manure. Productive and Reproductive performance of farm animals is primarily dependent on their nutritional status. More often than not, goats are always malnourished, particularly with regards to micronutrients. Emphasis has put on area specific mineral mapping and deficiency in soil, feed and fodder. Adequate micro-minerals supplementation is required as most of the roughages, greens, concentrates are deficient in trace mineral elements. Addition of 2 to 2.5% mineral mixtures is recommended to get rid of mineral deficiency. But, over the period, the cost of mineral mixture is sky high and it's beyond the reach of poor farmers. Therefore, recommendation was made to supplement the area specific deficient mineral which is dam cheaper than commercial one. Present study was conducted to see the effect of deficient minerals on reproductive performance and blood metabolites.

MATERIAL AND METHODS

The present study had been carried out on 18 Black Bengal Doe of 1st parity and managed at IVRI, ERS at Kalyani campus. All the animals were physically healthy at the time of selection and managed in semi-intensive system and penned in pucca house. The animals were randomly distributed into three groups, having six females each. Apart from 6-8 hours grazing, Group I (n=6) animals were supplemented with concentrate @300 g/head/day without mineral mixture. Group II (n=6): animals were supplemented with @300 g conc. /head/day fortified with commercial mineral mixture @ 2 %. Group III (n=6): animals were managed under supplementation of concentrate @300 g/head/day fortified with ASMS @2%. The area specific mineral supplementation (ASMS) is made up of Di-calcium phosphate (DCP)-3000 part, Zinc sulphate- 40 parts, Copper sulphate- 20 parts, Cobalt sulphate- 2 parts, Manganese sulphate-1 part.

Necessary blood samples were collected from jugular vein in heparin coated vial at monthly interval from each animal. Blood samples were centrifuged in particular time interval and plasma and serum were separated for estimation of blood metabolites. The copper soap extraction method modified by Shipe *et al.* (1980) was adopted for the determination of plasma NEFA. SGPT/ALT (Serum Glutamic Pyruvic Transaminase) was estimated by 2, 4-DNPH (Reitman and Frankel Method), using commercial kit (Span Diagnostics Ltd., India). SGOT/AST (Serum Glutamic Oxaloacetic Transaminase)was estimated by 2, 4-DNPH (Reitman and Frankel Method), using commercial kit (Span Diagnostics Ltd., India). Suitable statistical procedure has followed to analysis of data recorded under various experiments in this study. Different statistical designs were considered to analysis of data.

RESULTS AND DISCUSSIONS

Non-Esterified Fatty Acids (NEFA)

Blood NEFA level of pre-partum black Bengal does present in table -1. Present study revealed that NEFA values did not differ significantly ($P<0.05$) among groups at different intervals. There is gradual increase in NEFA level with the enhancement of pregnancy because of higher demand of energy during later stage of pregnancy. Overall Mean NEFA level in group I, group II and group III was 0.244±0.026, 0.245±0.056and 0.237±0.028 mmol/L respectively

Present finding was almost to J R Khan *et al.* (2002) who stated that the plasma NEFA levels were low in both the groups of ewe (twin and single fetus) up to 4th fortnight and thereafter it is continuously increased up to 9th fortnight from (0.19-0.26 mM/L) and (0.21 to 0.27 mM/L) in twin and single fetus bearing goats.

The lower level of plasma NEFA concentration up to 4th fortnight may be due to less energy requirement at early pregnancy; hence there may be deposition of fat during this period. After 4th fortnight onwards the glucose utilization by the developing fetus increased, the requirement was apparently met by the release of NEFA from the depot fat, hence the concentration increases. The present findings are in agreement with Faulkner (1983) that the deposition and mobilization of fat during pregnancy are biphasic processes. On the day of kidding in both the groups a sharp increase in NEFA concentration are coincided with sharp declines in glucose and insulin concentration (Khan, 1998).

Veron (1980) reported that the release of NEFA in to the blood plasma from the adipose tissue during late pregnancy was associated with decreased activity of acetyl Co-Acarboxylase, glucose phosphatase and NADP malatedehydrogenase and also observed that the decrease in plasma insulin in sheep contributed to mobilization of fat at this time. During late pregnancy the high requirement of glucose for fetus lowered the glucose and insulin concentration, and body reserves were used up, so increasing the NEFA concentrations (Lindsay, 1974). Studies reporting effect of

mineral supplementation on NEFA level are scarce. Solaiman *et al.*(2006) reported that supplementation of Cu affected resulted in decreased NEFA level at 112 days as supplemental Cu increased.

Table 1: Plasma Non-Esterified Fatty Acids (Mean ± SE) (mmol/L) Level of Different Groups of Black Bengal Does

Treatment	Plasma NEFA Level of Different Group at Various Time Interval						Overall
	0 Day	30 Day	60 Day	90 Day	120 Day	145 Day	
Group I(Control)	0.162±0.020[a]	0.160±0.024[a]	0.230±0.020[a]	0.288±0.024[a]	0.318±0.040[a]	0.415±0.118[a]	0.244±0.026[a]
Group II(2% CMM)	0.154±0.024[a]	0.162±0.040[a]	0.200±0.044[a]	0.292±0.077[a]	0.316±0.102[a]	0.452±0.040[a]	0.245±0.056[b]
Group III(2% ASMM)	0.206±0.044[b]	0.219±0.073[b]	0.184±0.028[a]	0.253±0.024[a]	0.296±0.044[a]	0.317±0.044[a]	0.237±0.028[a]

*Values bearing different superscripts in column differ significantly ($p<0.05$) from each other

SGPT

SGPT level in different groups has been presented in table 2. Overall Mean SGPT level in group I, group II and group III was 33.47±2.4, 36.45±3.32and 34.89±3.10 IU/l, respectively. The present study reflects that the gradual increase of SGPT levet with advancement of pregnancy. In pregnancy stage, the metabolic activity is increased many folds therefore, SGPT level also was more. Exton (1980) reported that in growing lambs value of SGPT and SGOT was higher inlambs supplemented with mineral mixture than mineral deficient lambs.Jain *et al.* (2005) observed effect of urea molasses mineral granules in goat kids. Slightly higher value was reported by Amir Hossan Shaikat *et al.* (2013).

Table 2: SGPT Level (Mean ± SE) (IU/L) of Different Treatment Group

Treatment	SGPT Level at Various Time Interval						Overall
	0 Day	30Day	60 Day	90 Day	120day	145day	
Group I(Control)	16.31±2.82[a]	22.13±2.14[a]	31.18±2.05[a]	35.94±2.50[a]	41.16±1.34[a]	46.63±2.08[b]	33.47±2.4[a]
Group II(2% CMM)	18.23±1.44[a]	26.02±2.17[a]	31.11±3.50[a]	36.71±2.33[a]	41.12±1.64[a]	55.18±4.43[a]	36.45±3.32[a]
Group III(2% ASMS)	16.90±3.09[a]	24.20±2.82[a]	33.38±2.50[a]	36.51±3.04[a]	43.68±0.69[a]	51.37±4.54[a]	34.89±3.10[a]

*Values bearing different superscripts in column differ significantly ($p<0.05$) from each other

SGOT

SGOT level in different groups has been presented in table 3. Overall Mean SGOT level in group I, group II and group III was 125.53±6.45, 128.67±4.34and 127.40±4.24 IU/L respectively. These findings are in agreement with Sharma *et al,* (2011) who observed that SGOT level was higher in mineral supplemented heifers compared with control group. Exton (1980) also reported that in growing lambs value of SGOT was higher in lambs supplemented with mineral mixture than mineral deficient lambs. These results are also corroborated with findings of other studies in several species (Jain *et al,* 2005; Tiwari *et al,* 2012; Gunjan *et al,* 2011; Saini *et al,* 2009).

Table 3: SGOT Level (Mean ± SE) (IU/L) of Different Groups of Black Bengal Does

Treatment	SGOT Level at Various Time Interval						Overall
	0 Day	30Day	60 Day	90 Day	120day	145day	
Group I(Control)	108.35±3.71[a]	110.33±3.38[a]	118.44±9.29[a]	117.63±5.56[a]	134.04±4.44[a]	141.91±7.32[a]	125.53±6.45[a]
Group II(2% CMM)	111.10±8.26[a]	121.54±4.08[b]	127.50±4.30[a]	129.91±4.91[a]	134.65±2.98[a]	135.81±3.58[a]	128.67±4.34[a]
Group III(2% ASMS)	111.88±4.16[a]	115.98±4.08[a]	126.37±4.89[a]	123.73±4.89[a]	136.79±4.65[a]	149.86±3.96[a]	127.40±4.24[a]

Estrogen

Estrogen level in different groups has been presented in table-4. Present study revealed that estrogen level did not differ significantly (P<0.05) among different groups. Overall Mean Estrogen level in group I, group II and group III was 98.45±4.21, 110.94±4.32and 105.87±3.27pg/ml respectively. These findings are in agreement with Devasenat *et al,* (2010) who observed that estrogen level was higher in mineral supplemented crossbred cattle compared with control group.

Table 4: Estrogen (Mean ± SE) (pg/ml) Level of Different Treatment Groups

Treatment	Plasma Estrogen Level at Various Time Interval						Overall treatment Mean ±SE
	0 Day	30Day	60 day	90 day	120day	145day	
Group I(Control)	7.70±1.7[a]	2.70±0.05[a]	46.83±2.29[b]	102.99±2.57[a]	203.56±7.25[a]	227.66±10.99[a]	98.45±4.21[a]
Group II(2% CMM)	10.00±1.4[a]	3.90±0.03[a]	55.90±1.86[a]	123.94±3.91[a]	214.78±6.72[a]	256.93±11.97[a]	110.94±4.32[a]
Group III(2% ASMS)	9.80±1.90[a]	3.70±0.08[b]	48.75±2.85[a]	116.16±2.98[a]	215.00±6.40[a]	240.00±12.38[a]	105.87±3.27[a]

Progesterone

Progesterone level in different groups has been presented in table -5. Overall Mean Progesterone level in group I, group II and group III was 7.08±1.42, 8.89±1.62 and 8.56±1.84 ng/ ml respectively. These findings are in agreement with Devasenat *et al.*(2010) who observed that progesterone level was higher in mineral supplemented crossbred cattle compared with control group.

Table 5: Progesterone (Mean ± SE) (ng/ml) of Black Bengal Goats of Different Groups

Treatment	Progesterone Level of Different Groups at Various Time Interval(ng/ml)						Overall treatment Mean ±SE
	0 Day	30Day	60 day	90 day	120day	145day	
Group I(Control)	1.13±0.29[a]	6.30±1.14[a]	10.10±1.81[a]	11.65±1.78[a]	10.31±1.78[a]	2.81±0.77[a]	7.08±1.42[a]
Group II(2% CMM)	1.16±0.26[a]	7.86±1.13[a]	11.65±1.91[a]	13.02±2.25[a]	11.63±1.83[a]	3.89±0.63[a]	8.89±1.62[a]
Group III(2% ASMS)	1.27±0.30[b]	9.01±1.65[a]	10.96±1.96[a]	14.99±1.90[a]	11.74±2.21[a]	3.14±0.94[a]	8.56±1.84[a]

CONCLUSIONS

Performance of deficient mineral supplement is at per with the Commercial mineral mixture. Being very low in cost as compared to commercial mineral mixture, deficient mineral supplement (KALMIN-ERS) can prove very cost effective for marginal farmers.

REFERENCES

1. Bergman, E. N. 1983.The pool of nutrients: Glucose. In dynamic biochemistry of animal production. World Animal Science'A' Basic information 3, Riss, PMednElsevire publ. Amsterdam The Netherlands. pp. 173-196.
2. Devasenat B., Reddy I.J., Ramana, J.V., Prasad P. E., Prasad J.R., 2010. Effect of Supplementation of Area Specific Mineral Mixture on Reproductive Performance of Crossbred Cattle -A Field Study. Indian Journal of Animal Nutrition **27**3: 265- 270.
3. Exton, J.H.1980. Effect of diets low in calcium and phosphorus on development of growing lambs. American J. of Physiology.**3**:235-38.
4. Hay, W. W. Jr, J. W. Sparks, R. B. Wilkening, F. C. Battaglia and G. Meschia. 1983. Partitioning of maternal glucose production between conceptus and maternal tissue in sheep. Am. J. Physiol**. 245**:347-350.

5. Jain, N., Tiwari, S.P. and Singh, P. 2005. Effect of urea molasses mineral granule on rumen fermentation pattern and blood biochemical constituents in goat kids fed sola grass based diet. Vet. Archiv.**75 6**:521-530.
6. Khan JR., LudriRS. 2002. Changes in blood glucose, plasma nonesterified fatty acids and insulin in pregnant and non-pregnant goats. TropAnim Health Prod 34:81–90.
7. Khan, J. R. 1998.Circulatory level of some hormones, metabolites and haematological parameters during pregnancy and parturition in crossbred goats. Ph. D. Thesis. National Dairy Research Institute Deemed University Karnal, India.
8. Leury, B. J., A. R. Bird, K. D. Chandler and A. W. Bell. 1990. Glucose partitioning in the pregnant ewe: Effect of under nutrition and exercise. Br. J. Nutr. 64:449-462.
9. Leury, B. J., A. R. Bird, K. D. Chandler and A. W. Bell. 1990.Glucose partitioning in the pregnant ewe: Effect of under nutrition and exercise. Br. J. Nutr. **64**:449-462.
10. Lindsay, D. B. 1974. Metabolism in the whole animal. Proc. Nutri. Soc. 38:295.
11. Oddy, V. H., J. M. Gooden, G. M. Hough, E. Teleni and E. F. Annison., 1985. Partitioning of nutrients in Merino ewes.II Glucose utilization by skeletal muscle, the pregnant uterus and the lactating mammary gland in relation to whole body glucose.
12. Prior, R. L. and R. K. Christenson., 1978. Insulin and glucose effect on glucose metabolism in pregnant and non-pregnant ewes. J. Anim. Sci. 46:201-210.
13. Reitman, S. and Frankel S. 1957. Am. J. Clin. Path., **28**: 56.
14. Shaikat AH, Hassan MM, Khan SA, Islam MN, Hoque MA, Bari MS and Hossain ME., 2013 Haematobiochemical profiles of indigenous goats Capra hircus at Chittagong, Bangladesh, Veterinary World **610**:789-793.
15. Sharma, J., Kumar, A., Tiwari, D.P., and Mondal, B.C., 2011. Effect of dietary supplementation of calcium, copper and manganese on nutrient utilization, growth, blood-biochemical and mineral profile in crossbred heifers.Indian J. of Ani.Sci**. 81 5**:493-497.
16. Shipe, W.F., Senyk, G.F. and Fountain, K.B., 1980. Modified copper soap extraction methods for measuring free fatty acids in milk. J. of Dairy Sci. **63**2: 193-198.
17. Solaiman, S.G., Shoemaker, C.E., Jones, W.R. and Kerth, C.R., 2006. The effects of high levels of supplemental copper on the serum lipid profile, carcass traits, and carcass composition of goat kids. J. of Anim Sci. **84**: 171-177.
18. Tiwari, M.R., Shrestha, B.K., Mandal, P. and Pandey, L.N., 2012. Growth performance of Khari goats on supplementation of UMMB in fodder based diets. Nepal J. of Sci. and Technology.**13 2**:29-32.
19. Veron, G. W., 1980. Lipid metabolism in adipose tissue of ruminant animals. Progress in Lipids Research 19:23.
20. Veron, G. W., 1980. Lipid metabolism in adipose tissue of ruminant animals. Progress in Lipids Research 19:23.
21. Wilson, S., 1984. The metabolism of fatty acids in undernourished pregnant ewes. Can. J. Anim. Sci. **94**:246-247.