

MINERAL STATUS OF BROWSING GOATS IN NORTH WESTERN PROVINCE AS INFLUENCED BY FEED, SOIL AND SEASONS

M. M. MAHUSOON, M. Phil.

Degree : Doctor of Philosophy in Animal Science
Chairman : Prof. A. Nimal Perera, Ph. D
Institution : Post Graduate Institute of Agriculture, University of Peradeniya, Sri Lanka
Year of Award : 2006

ABSTRACT

A series of studies were carried out to investigate the mineral status of free browsing goats as related to soil, forage and seasons in the North Western Province of Sri Lanka. A study was conducted to determine the macro and micro mineral status of soil, forage and goats. Cross-bred male and female goats (Jamnapari X Indigenous, Saanen X Indigenous, Jamnapari X Saanen, Boer X Indigenous, and Jamnapari X Kottukkachiya) at different physiological conditions viz; suckling (<6 months), growing (6-12 months), matured (>1 year), pregnant (>1year), lactating and non-lactating does reared under the extensive management systems in three different agro-climatic zones were used.

Soil organic matter, pH, calcium (Ca), magnesium (Mg) and potassium (K) were higher in the dry zone compared to other two zones. Mean Ca and Mg contents in soil were adequate in all three zones. Mean soil K content was adequate in dry and intermediate zone while deficient in wet zone.

No deficiency levels were indicated in forage Ca, Mg and K in all the zones. Forage P and Na were higher in shrub, herb and wines. Deficiency levels were indicated for P and Na in tree leaves and grasses. Hence ration formulation for range goats should include Na and P. Plasma analysis has shown that Ca levels were lowest in milking and adult animals in all zones. Phosphorus was lower in younger animals. Magnesium levels increased with the age. Plasma K levels were similar in the dry region; but male and female suckling in the intermediate zone and milking and non-lactating does in the wet zone indicated below the critical value. Plasma Na levels decreased progressively with the age. High correlations were found between macro mineral contents of soil and forage in the diets and plasma of the animals.

The micro minerals of soils revealed that soil copper (Cu), zinc (Zn), and iron (Fe) and manganese (Mn) were adequate in all three zones, and high in wet zone. The highest range of was found in trees non-leguminous fodder, while highest concentration of Zn was observed in tree leguminous fodders and shrubs.

Iron and Mn contents were higher than the dietary requirement. Blood plasma Cu levels were found to be increased with the age but plasma Zn concentration was observed vice-versa. Plasma Cu level increased with age could be associated with its role to oestrogen level. Zinc levels of plasma found to be higher in young animals that could be related the high Zn-binding enzyme necessary for growth and development. The concentration of plasma Fe recorded higher among the pregnant animals. Plasma Mn level was found to be high in adult animals. Goats maintained under free range browsing systems showed no deficiency in micro minerals.

Another study examined Mo supplementation on nematode infection and weight gain as related to season. Four treatments consisting of 10 goats each were used as control-free grazing only (T_0); free grazing plus mineral block without Mo (T_1); free grazing plus mineral block with molybdenum of 2 mg Mo Kg^{-1} block (T_2) and free grazing plus mineral block with molybdenum of 10 mg kg^{-1} block (T_3). The results showed that the concentrations of minerals in forage were higher during the rainy season. Calcium, Mg, K, Fe and Mn contents in all forages were above the recommended levels during both rainy and dry seasons. During the rainy season 23% and 32% forage samples were deficient in Na and P; while in dry season the respective deficiencies were 91% and 100%. Forage Cu and Zn contents were inadequate due to mineral supplementation. Plasma Ca, Mg, K, Zn, Fe and Mn contents were above the critical level recommended during both seasons, while 20% and 33% of plasma samples were deficient in P and Cu, respectively. Molybdenum supplementation reduced the nematode egg count and improved haematocrit value, haemoglobin concentration and body weight gain of goats suggesting beneficial effects of molybdenum.

An experiment was due to evaluate the effects of three different sources of phosphorus supplements on growth performance, nutrient utilization, mineral balance, nitrogen retention, rumen parameters, blood bio chemical profile and plasma mineral contents of goats. The experimental diets were prepared using three different sources of phosphorus i.e., dicalcium phosphate (DCP), highly soluble Eppawele rock phosphate (HERP) and Eppawele rock phosphate (ERP). Twelve young growing male cross-bred (Saanen x Jamnapari) goats were subjected to four treatments. The treatments were; control (T_0) –without any phosphorus supplementation, phosphorus supplemented with DCP (T_1); phosphorus supplemented HERP (T_2), and phosphorus supplemented with ERP (T_3). The results revealed that phosphorus supplementation increased with feed intake, weight gain, and nutrient digestibility. Mineral balances and nitrogen retention were improved by supplementing phosphorus sources. Rumen parameters and blood bio chemical profile were also improved phosphorus supplementation. Plasma mineral contents were higher while adding phosphorus sources. Among the phosphorus supplemented diets, highly soluble Eppawele rock phosphate showed the highest responses

to the above mentioned parameters. Therefore, highly soluble Eppawele rock phosphate (HERP) could be used as phosphorus supplement.

It was concluded that macro-and micro minerals of Ca, Mg, K, Cu, Zn, Fe and Mn were adequate while Na and P were deficient in soils of dry, intermediate and wet zone of the North Western Province of Sri Lanka. Plasma macro- and micro minerals of goats reflected the physiological status of the animal. Most of the forage showed adequate levels of all micronutrients, which were also reflected in animals. Inclusion of Mo at 10 mg kg⁻¹ block was beneficial to goats for improving blood parameters, suppression of worm infestation and live weight gain. Supplementation of HERP significantly increased feed intake, weight gain and improved blood biochemical profile.