SOIL-PLANT COMPOSITION IN RELATION TO MACRO AND TRACE ELEMENT REQUIREMENTS FOR GRAZING CATTLE IN UASIN GISHU DISTRICT

BY

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DECLARATION

I declare that the work presented in this thesis is my original work and has never been presented for a degree in any other University. This thesis has been submitted with approval of the University Supervisors:

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ABSTRACT

This study was carried in the six divisions of Uasin Gishu district in which twenty-eight (28) soils, twenty-eight (28) forage and forty-two (42) serum samples were collected at different sites. The study was necessary since the region had grazing cattle experiencing reduced growth, anaemia, reduced conception rates and fertility, which are symptoms of mineral deficiencies. Sampling sites were classified in terms of the forage species most favoured for grazing by the available cattle and age and breed of the grazing cattle. The purpose of the study was to determine the status of both macro- and trace elements in forages and compare them with those in grazing cattle and the soils on which forage grow, so as to identify those that might be limiting animal health and nutrition within the district. Soils were analyzed for extractable macro minerals; sodium (Na), potassium (K), calcium (Ca), magnesium (Mg) and trace elements; iron (Fe), manganese (Mn), copper (Cu), and zinc (Zn). The forage samples were assayed for the same elements plus phosphorus (P) as total concentration on dry matter (DM) basis while blood serum was analyzed for the same forage elements plus molybdenum (Mo). Atomic absorption spectrophotometer (AAS) and UV/Visible spectrophotometer (UV/V) were used to analyze metal elements and nonmetals respectively. Forage analysis revealed wide variations in mineral element concentrations. The mean values were as follows: Na-1.00 ± 0.30); K-11.8 ± 5.00; Ca-0.57 ± 0.19); Mg-1.35 ± 0.72; P-6.34 ± 3.22 in g/kg DM; Fe-56± 0.53; Mn-105 ± 0.58); Cu-5.32 ± 2.84 and Zn-19.50 ± 8.26 in mg/kg DM. The results revealed acute deficiencies of some mineral elements in forages. The percentage of forage samples with deficient elements was: 93(Na), 89(Mg), 93(Cu) and 39(Zn). Grazing cattle and soils revealed similar deficiencies in some minerals. The percentage of soil samples with deficient elements was: 14(Cu) and 4(Zn). The percentage of calves' serum samples with deficient elements was: 50(Mg) and 61(Cu) while the percentage of cows' serum deficient in the same minerals was 21(Mg) and 42(Cu). In other cases, cattle revealed further deficiencies in some minerals, which were quite different from those detected in forages. Soil pH and mineral interrelationships within samples were factors influencing mineral concentrations in the region. The soil pH range 5.1-7.2 was optimal for iron and copper concentrations. Correlation analysis of the results indicated that all the elements except calcium and copper revealed a small but positive relationship between soil and forage mineral concentrations. Rhodes/Kikuyu grass mixture gave the highest mineral concentration whose difference was significant ($P<0.05$) as compared to other grass species (Rhodes (*Chloris gayana*), Kikuyu (*Pennisetum Clandestinum*) and Natural grass). Friesian calves and lactating cows had a better mineral content ($P<0.05$) than either Ayrshire or Ayrshire/Friesian crossbreed. Recommendations on supplementation to animals have been suggested to help identify and alleviate any constraints on animal health and production.