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SUMMARY OF DOCTORAL THESIS

Name: Victor Alexander Mwijage Kakengi

Title: **NUTRITIVE AND FEEDING VALUES OF FORAGES AND ITS IMPACT TO LIVESTOCK PERFORMANCE IN TANZANIA**

In the previous study, it has been found that not only low forage protein content of the tropical forages affects animal production but also its low trace minerals contents threatens animal reproduction improvement, *i. e.*, this was revealed in the study that involved grass and mostly grazed forages and its implication to ruminant reproduction performance, the results of which is briefly presented in this thesis. The next five studies dwelt on livestock production where alternative protein sources were studied. Tree forages were either compounded with cheap and locally available feed resources to replace or substitute the expensive conventional feed supplements.

The experiment was devised to sort out the problem of scarcity of animal feed resource, particularly during the dry season, which is a major constraint to livestock production in the tropics. Animal feed supplement such as sunflower seed cake (SSC) are too expensive to most farmers. Therefore, alternative resources need to be investigated. *Moringa oleifera Lam* (Moringaceae) is a multipurpose tree, the leaves of which are used as animal feed in many places; but its potential as animal feed supplement has not been documented. The effect of substituting SSC with different levels of *M. oleifera* (MOOL) on dry matter intake (DMI), dry matter digestibility (DMD) and growth performance of small East African goats fed on low quality *Chloris gayana* hay was investigated in Morogoro–Tanzania. The supplementary treatments were different levels of MOOL, so that the proportions of MOOL to SSC were 0:100, 25:75 and 100:0. All animals were fed with *Chloris gayana* hay as a basal ration. After preliminary feeding period of 14 days, DMI data were collected for 21 days. Restricted feeding and collection of urine and faecal samples for analysis were carried within 7 days of the preliminary period and 14 days of data. A significantly higher DMI and metabolisable energy intake (MEI) were observed at 75 and 100% MOOL supplementary levels. Increased replacement levels of SSC with MOOL increased the digestibility of DM (dry matter) and NDF (neutral detergent fibre). Goats fed 25 MOOL (T2) had significantly higher nitrogen retention than goats in the other treatments. The treatments were not different in terms of effect on the growth rates of the goats. The result suggests that MOOL could be used as a substitute for SSC, the conventional supplement feed. (Experiment I)

Animal production in the tropics is threatened by poor nutritional status of tropical forages. Concentrate supplementation is the only way to improve production performance. However, concentrates are often too expensive to small and medium scale farmers to afford. Therefore, The possibility of utilizing tropical forages such as *Leucaena leucocephala* leaf meal (LLM) added to a diet

composed of cotton seed hulls (CSH) and maize bran (MB) (which are locally and readily available) on milk yield, milk composition and body weight changes of grazing lactating cows was done: Marginal product (MP) analysis for the different levels of LLM as a substitute to cotton seed cake (CSC) was also studied. Results showed that LLM supplementation to grazing cows increased milk yield, milk total solids and resulted into weight gain by cows. It was concluded that 2.6 kg DM LLM could substitute the more expensive CSC. (Experiment II)

Despite the higher potential of LLM to ruminant production its wide use is threatened by *Leucaena psyllid (H.cubana)* which attacks the forage in the dry season when its demand is high resulting into reduced leaf yield. Therefore, alternative tree forage was thought and *M. oleifera* seemed to be a suitable substitute for *Leucaena leucocephala*. Therefore, different morphological parts (leaves, soft twigs, barks and *M. oleifera* leaves and soft twigs) of the forage were nutritively & anti-nutritively assessed. After that Assessment it was concluded that the high crude protein content in leaves and leaves and soft twigs could be well utilized by ruminant animals and increase protein to the lower gut of animals and high rumen degradable protein however, due to negligible tannin content render it relatively poor protein supplement for ruminants. The seed cake of *M. oleifera* could be a best alternative protein supplement to ruminants. However, rumour that the cake of *M. oleifera* contains anti-nutritional factors that can have a deleterious effect when excessively fed to animals triggered importance of studying the safe feeding level of the cake. (Experiment III)

A total of 48, eight weeks of age Std:ddY strain mice (24 male and 24 females) were used in the study. The MOC levels were 0% (control), 12.5, 25 and 50% respectively. Bodyweight were taken daily and internal organ's observation was done after sacrificing the animals on the 40th day of experiment. Post-mortem of internal vital organs was undertaken. It was concluded from the study that MOC could be used as a protein supplement to monogastric animals; however, the supplementation level should not exceed 12.5% of the total daily intake. Due to the fact that *M. oleifera* leaves were not suitable protein supplements to ruminants. (Experiment IV)

The effect of *M. oleifera* leaf meal as substitute for sunflower meal (SSM) on performance of laying hens was undertaken. Four dietary treatments based on MOLM & SSM as plant protein were developed such that MOLM reciprocally replaced SSM at levels of 20, 15, 10, giving the dietary treatment containing 0, 5, 10, & 20% MOLM levels. Parameters measured were feed intake (FI), Egg weight (EW), laying percentage (LP), egg mass production (EMP) and feed conversion ratio. The results suggest that MOLM could completely replace SSM up to 20% without any effect in laying chickens. However, for better efficiency 10% inclusion level is optimal and an additional of MOLM above 10% high-energy based diet is required for better utilization. (Experiment V)