The Relationship between Ruminal Macro Mineral Solubility and Fermentability of Selected Tropical Legumes Tree with Mineral Absorption on Local Sheep

I.G. Permana, N.P. Haryanti and Suharlina
Department of Nutrition and Feed Technology, Faculty of Animal Science,
Bogor Agricultural University
email: permana@ipb.ac.id

ABSTRACT

A research to study relationship between macromineral solubility, fermentability of some tree legumes with *in vivo* digestibility using local sheep has been conducted. In the first experiment, five tropical legume trees such as *Pterocarpus indicus* (PI), *Sesbania gradiflora* (SG), *Gliricidia sepium* (GS), *Callyandra callotyrsus* (CC) and *Leucaena leucocephala* (LL) were used. A modified *in vitro* technique was used to determine degradation, fermentation and macromineral bioavailability of selected legume trees. The gas production was measured using Hohenheim method. The ruminal DM degradation and the cumulative gas productions were calculated using a model of $Y = a + b\ (1\text{-}e^{-ct})$ following method of Ørskov and McDonald (1979). The second experiment aimed to evaluate macro mineral abroption of the legumes. The *in vivo* digestibility was measured using eighteen male local sheep. The animals were divided into 6 groups with 3 replications (A = native grass as a control, B = Ration A + 20% PI, C = Ration A + 20% SG, D = Ration A + 20% GS, E = Ration A + 20% LL and F = Ration A + 20% CC). The results showed that biodegradation and cummulative gas production of selected legume trees were not significantly different. However, the gas production rate of SG and GS were significantly higher. No difference was observed on VFA production of the legumes, while the NH_3 production was different. Legume SG produced more NH_3 than other tree legumes. In general, the ruminal Ca solubility was higher than P and Mg. The solubility of Ca and Mg of legume LL were higher than other legumes, while the solubility of P from legume LL was the highest. The *in vivo* experiment showed that digestibility of the ration containing 20% of tropical legume trees was no difference. However, the DM and OM consumption of ration were significantly different. The DM and OM consumption of ration D was higher (398 and 347 kg head $^{-1}$day^{-1}) than other rations. The absorption of mineral Ca and P from ration E was higher than other legumes.

Key words: *tropical tree legumes, macromineral, solubility, fermentability*, *in vivo digestibility*

INTRODUCTION

In tropical countries, legume is normaly used as protein sources to increase the quality of grasses in ruminant ration. Legume is adaptable in a wide range climate and soil condition, even under heavy grazing (Khamseekhiew, 2001). Legume tree is more adapted in tropical climate. The mineral content of legume was higher than grass (Underwood and Suttle, 1999). Sutardi *et al*. (1994) reported that legume trees had macro mineral especially calcium and therefore the legumes tree can be used as mineral supplement.

In ruminant, minerals are required not only for the animal it's self but also for the activity of rumen microbes. The mineral are used for cellulolytic microbe activities, osmotic pressure, buffering capacity, and reduction potential in the rumen (Duran and Kawashima, 1990). Therefore, in assessing mineral requirements of ruminant, both the quantity of minerals in the feeds and their bioavailability need to be considered. A method that can be used to evaluate the mineral availability in the rumen is *in vitro* technique. A modified *in vitro* technique can measure the extent and rate of release of macrominerals (especially Ca, P. Mg and S) in the rumen where most of organic matter digested.

The aim of this research was to study DM degradability, fermentability, gas production and solubility of macro mineral (Ca, P. Mg and S) of selected legumes tree using *in vitro* and *in vivo* method.