The Evaluation of Rumen Metabolism of Fries Holstein (Fh) Calves Fed Biofermented Cocoa Pods Using *Phanerochaete Chrysosporium*

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ABSTRACT

An *in vivo* experiment was conducted to evaluate cocoa pods to substitute forages for ruminant. The experiment was carried out using latin square design on 5 head of FH calves with 5 treatments and 5 replications. Ration was designed iso-protein (17%) and iso-TDN (65%) used cocoa pod as forages (35%) and other cocoa by-product were used as concentrate (65%). The treatment consisted of concentrate plus untreated cocoa pods (R1); urea ammonia treated of cocoa pods (R2); silage of cocoa pods (R3); bio fermented of cocoa pods using rumen content (R4) ; and bio fermented of cocoa pods using *P chrysosporium* (R5). Variables measured were pH, N-NH3, VFA, Microbial Protein, Alantoin, Non Glucogenic Ratio (NGR), Ration Utilization Efficiency (EPR) , Net Protein Utilizatin (NPU) . Data were analyzed using analysis of variance and Duncan multiple range test was further used to test the significant differences. Results showed that rumen metabolism variables such as pH, N-NH3, VFA, Microbial Protein on ration consisted of cocoa pods bio fermented by *P. Chrysosporium* were increased (P<0,01) compared to the others. There was positive correlation between microbial protein and alantoin. Microbial protein and alantoin excreted to urine indicated that there was an increase of rumen microbe population, while NGR value had positive correlation with methane production (CH4). Ration containing cocoa pods bio fermented by *P. Chrysosporium* showed the lowest NGR as indicator for optimum ration utilization efficiency for animal growth. It was concluded that cocoa pods bio fermented by *Phanerochaete chrysosporium* Burdsall ATCC 34541 is potential to be used as forages replacing elephant grass.

Key words: Cocoa Pod, Bio fermentation, Phanerochaete chrysosporium Fungi, Rumen Metabolism

INTRODUCTION

The shortage of agricultural land and low quality of the forages and roughages, encourage us to use waste such as cocoa plantations (Theobroma cacao L.) as energy source for ruminant. In Indonesia, Cocoa Plant Area is almost 1.5 millions Ha in 2008 and it produced 75% Cocoa Pod as by product. Utilization of cocoa pods as mulch around plants can be a host for growth of fungus *Phytophthora palmivora* known as Black Pod Diseases (Awuah and Frimpong, 2002) which can disrupt the development of cocoa plants. This fungus causes late blight, leaf blight and the cancer stem in cocoa plants. Nutrient quality of cocoa pods is equal to elephant grass, with 53,3% of TDN (Aregheore, 2002). Cocoa pods is potential as forage sources for ruminant, which have energy sources such as hemicelluloses and cellulose. Cacao pods contain approximately 6,28% protein; 39,9% crude fiber; 1,61% crude fat; 82,84% NDF, 78,74% ADF and 35,27% lignin (Laboratory of Feed Science and Technology IPB, 2005). Inhibitor factor in utilizing cocoa pods as feedstuff is high water content (85%) and lignin and also contains alkaloid *theobromine* (Tequia et al. 2004).

Utilization cocoa pods as energy sources were requires decomposition of lignin with polysaccharide bond becomes a simple product. Ration in high lignin can decrease consumption, ration digestibility and animal performances. Benefit values of cocoa pods as energy sources for animal could be improved by degradation of lignocelluloses bonds with biofermentation or ammonization (Taherzadeh, 1999). Lignin degradation could be done with bioprocesses by the ligninolytic fungi such as *Phanerochaete chrysosporium* (Amjed *et al.*, 1990) and rumen bacteria (Akin and Benner, 1988). P. *chrysosporium* fungi is one of the microorganisms White-rot fungi that can degrade lignocelluloses (Takano *et al.*, 2004; Coulibaly *et*