Utilization of Methanol Extracted Of Moringa And Mulberry Leaves To Evaluate Energy and Protein Balance Of Nile Tilapia

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Abstract

Fish ration should have high protein content. Source of feed protein usually comes from animal such as fish meal and waste of fishery industries. The price of animal protein like fish meal is quite expensive and that ingredient of feed has competitive problem with human food. Plant protein like legume leaves or other forage can be used for covering protein requirement of herbivore fish, but they contain high secondary compounds. These compounds may be removed by methanol extraction of the plant material, e.g. for moringa. The present study was carried out to evaluate energy balance of diet containing extracted moringa leaves and mulberry leaf meal each as 30 % protein replacement for fish meal in diets for Nile Tilapia. Three diets were designated as control diet prepared with fishmeal (C), diet 1 contain methanol extracted moringa (D-1) and diet 2 contained mulberry leaves (D-2). Fifteen Nile Tilapia were randomly kept in a 5 L capacity individual respiration chamber in which the oxygen consumption of each fish could be measured continuously (Focken et al., 1994). Prior to the experiment fish were fasted for two days in order to measure standard metabolic rate (SMR), routine metabolic rate (RMR) and spontaneous activity (SSA). After those measurements, fish were divided into three groups and fed with the test diets C, D-1 and D-2 at around 10-g feed per MBW (kg $^{0.8}$) using automatic feeders. Fish were weighed individually every week and the oxygen consumption continuously measured for gain information on the energy expenditure (EE). At the end of the eight week, fish were sacrificed and analyzed for energy retention (ER). Feed analyses were conducted to evaluate gross energy intake (GEI), while energy metabolism (ME) was calculated from EE plus ER. The data were subjected to ANOVA and statistical comparisons between the feeding groups were made using the Duncan's Multiple Range Test. Results showed that the average values of SMR, RMR and SSA were 49, 67 and 105 mg.kg$^{-0.8}$.h^{-1}, respectively. Energy intake for the control group was lower than for the other groups, while final body weight in group D-1 was the highest. The ratio EE and ME from GEI (%) were similar for groups, while ER (g) for group D-2 is the highest. It was concluded that methanol extracted moringa leaves and mulberry leaves are quite palatable and could replace 30 % of protein fish meal in diets for Nile Tilapia.

Keywords: Moringa, Mulberry, legume tree, SMR, RMR, SSA

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Introduction

Fish ration should have high protein content. Source of feed protein usually comes from animal such as fish meal and waste of fishery industries. The price of animal protein like fish meal is quite expensive and that ingredient has competitive problem with human food. Plant protein like legume leaves can be used for covering protein requirement of herbivore fish, but in tropical legumes they contain high secondary compounds, which have a side effect to the user. The other alternative forage which also content high protein is *Moringa oleifera* Lam and mulberry (*Morus* sp.) leaves.

Moringa oleifera is tree which grows throughout most of the tropics and has several industrial and medicinal uses (Becker and Makkar, 1999). They are not legumes and also not a gramineae; some people call it "The Miracle Tree". They has multifunction such as human food, water purification, medicinal products and animal and fish feed (Becker and Makkar, 1999: Foidl *et al.*, 2001). In Indonesia, in such area like Bali, Madura, Nort Sumatra and South Sulawesi island, people eat those leaves and especially for lactating mother. While in India, Nicaragua and Niger there are a lot of *Moringa oleifera* plantation and uses for multi purposes. It was reported that replacement of 20 and 30 % of the total dietary protein with freeze-dried *Moringa oleifera* leaf meal for Nile tilapia had decreasing of growth performance caused of the relatively high secondary compounds like total phenolics, saponin and phytic acid, as well as NDF and ADF (Richter *et al.*, 2003). Afuang *et al.* (2003) reported that methanol-extracted residues and methanol extracts of moringa leaf meal had no significant effect on the growth performance compared with control diet in Nile tilapia and so far it was concluded that those diets reduced the plasma and muscle cholesterol. The nutritional and energy content of extracted and unextracted moringa leaves are 43.50 and 25.10; 1.40 and 5.40 ; 47,40 and 21.90; 16.30 and 14.10 %; 17.70 and 18.70 MJ/kg for CP, CL, NDF, ADF and GE, respectively (Gupta *et al.*, 1989). Makkar and Becker (1996) reported that anti nutritional components of whole and extracted moringa leaves which is important information for animal feed are glucosinolates, saponin, total phenols, tannins and cyanogenic glycosides in pars of moringa plant.

There are a lot of Mulberry species. Ekastuti *et al.* (1996) reported the nutrient content of five kinds of mulberry leaves such as Morus cathayana, M. nigra, M. canva, M. multicaulis and M. alba from Indonesia in different cutting stage which have 15.71 – 22.59; 3.70 –