

The Effect of Starter Addition on Digestibility Value of Complete Feed Fermentation-Based Kumpai Minyak Grass (*Hymenachne amplexicaulis*)

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ABSTRACT

The aimed of this study was to determine the effect of starter addition in complete feed fermentation based on Kumpai Minyak grass. Materials used in this study were Kumpai Minyak grass, palm kernel oil, tapioca waste, rice bran, and SBP[®] starter. The materials were mixed and kept in the plastic bag and storage until the day of length fermentation time. The data were analyzed using a two-way ANOVA based on completely randomized design (CRD). The main treatments was levels of inoculants (I0 = 0; I1 = 0.01; I3 = 0.03; I5 = 0.05%) with 7 days of fermentation. Dry matter digestibility (DMD) and organic matter digestibility (OMD) variables were measured. The results showed that the addition of different levels of inoculant (SBP[®]) had the highest digestibility on 0.05% level (P<0.05). The addition of 0.05% level of inoculant capable of increasing the DMD and OMD of complete feed fermentation based on Kumpai Minyak grass.

Keywords: Complete feed, Digestibility, Fermentation, Kumpai Minyak grass

INTRODUCTION

Kumpai Minyak grass (*Hymenachne amplexicaulis*) is one of the dominant grass that grow and develop in swamp land and become the main feed for ruminant livestock at some area in South Sumatra. Kumpai Minyak grass grow and develop rapidly during the rainy season and decreases its productivity during the dry season. This is due to Kumpai Minyak grass is very dependent on water to grow and result in a prolonged dry season grass. Based on analysis of nutrient composition, *Hymenachne amplexicaulis* has crude protein content (CP) of 10.88% (Rostini et al., 2014) and has a high content of fiber fraction comprising 71.00% Neutral Detergent Fiber (NDF) content; Acid Detergent Fiber (ADF) 41.0% and lignin 3.68% (Fariani et al., 2008). The composition is still considered very low to meet the needs of ruminant livestock nutrition singly. Therefore, it is necessary to develop an innovation of feed processing technology by increasing the nutritional value of feed ingredients in order to be able to overcome the availability of feed material and livestock nutrients during the dry season.

Complete Feed is a food processing technology by mixing all feed ingredients consisting of forage and concentrate into a single mix ration, without or with little additional feed ingredients, except drinking water. Complete Feeds with local forage sources and agricultural wastes are expected to meet livestock nutrition requirements and maintain the availability of feed at a relatively cheaper cost (Sadeli, 2014).

However, Complete Feed with feed sources derived from agricultural waste generally has limiting factors of high fiber content and caused the digestibility of feedstuff has lower. Fermentation is a technological innovation by utilizing microorganisms to produce the

desired product. Fermentation by fiber-digesting bacteria can degrade the *lignocellulose* and *lignohemicellulose* bonds which are a crude fiber fraction furthermore increase nutrient digestibility in the digestive system. Thus, fermentation with addition of certain inoculants can cause acidity in the feed material which resulted improve preservation of feedstuffs.

This study is expected to contribute information and recommendation of using complete feed-based fermentation Kumpai Minyak grass inoculant and local raw materials to reach the highest value of digestibility.

MATERIALS AND METHODS

Complete feed fermentation preparation

The ration formulation is based on protein and energy compositions with 10% crude protein and 60% TDN. The rations used in this study were Complete Feed based on Kumpai Minyak grass (*Hymenachne amplexicaulis*) and local raw materials with various types of inoculations levels.

About 1 kg sample with the percentage of Kumpai Minyak grass 550 g was cut in 3 – 6 cm size with 65% moisture content. Concentrate based on local raw materials with 450 g consist of 7% of tapioca waste, 13% of rice bran, 25% of palm kernel oil, and 3% of molasses were added which then mixed with SBP[®] according to treatment levels (0; 0,01; 0,03; 0.05%) and added water to 40% of moisture content of complete feed.

After all the ingredients are mixed, the material is filling into a white plastic bag which then during the filling process is not pressure or compaction with the assumption that there is still little oxygen between the materials and then the silo bag closed tightly by using impulse sealer, wrapped in a black plastic bag and fermented for 7 days. Ingredients and chemical composition of complete feed are shown in Table 1.

Table 1. Ingredients and nutrient composition of 7 days fermentation of complete feed based Kumpai Minyak grass

Items	Complete Feed
Ingredients of feedstuff (% DM)	
- Kumpai Minyak grass:	55.00
- Tapioca waste	7.00
- Rice bran	13.00
- Palm kernel oil	25.00
Nutrient Compositions (%) :	
- Dry matter	90.86
- Crude protein	9.77
- Ether extract	3.98
- Crude fiber	26.50
- Ash	1.06
- Nitrogen free extract	46.69

Methods

This research was conducted by using *in vitro* method. The design used was completely randomized design (CRD) with 4 treatments (I0, I1, I3, I4) and each treatment has 5 replications. Experiment was divided to 3 treatments I0 (control) without the addition of SBP[®], I1 treatment (0.01% SBP[®]), I3 treatment (0.03% SBP[®]), and I5 treatment (0.05% SBP[®]). The variables observed in this research are dry matter digestibility value and organic matter digestibility value.

Statistical analyses

Data obtained from observations and measurements were analyzed based on one-way ANOVA, if there is a significant difference between treatments followed by Duncan's Multiple Range Test (DMRT) (Steel and Torrie, 1993).

RESULTS AND DISCUSSION

Dry matter digestibility (DMD)

Dry matter digestibility is part of the dry matter in the diet that is digested by animals at a certain feed intake level. The digestibility of feed on ruminants is closely related to the amount and activity of rumen microbes and rumen capacity.

It can be seen the DMD value of each treatment that is I0 (41.76%), I1 (42.32%), I3 (42.72%) and I5 (51.84%) (Table 2). The treatment of I5 was significantly different ($p < 0.05$) from the other treatments. The low DMD in the treatment of I0, I1 and I3 of complete feed fermentation feed material is caused by the high content of crude fiber of the Kumpai Minyak grass. Kumpai Minyak grass is forage originating from swamp lands and has a high content of crude fiber (Fariani et al., 2008; Riswandi, 2014). Tillman et al. (1991) reported the content of crude fiber greatly affect the digestibility value of a feed material because this compound is a nutrient constituent that difficult to digest the cell wall.

Further, the researchers suspect the high DMD in the complete feed fermentation material in the treatment of I5 is caused by the decrease of crude fiber during the fermentation process which is the effect of bacterial activity (cellulolytic bacteria) that decreased cellulose contained in the inoculant shown by increasing the content of dry matter and organic feed material of complete feed. Al-arif and Mirni (2014) reported that the use of cellulolytic bacteria incubated for 7 days caused an increase in the content of dry matter and organic matter and decrease the content of crude fiber. Cellulolytic bacteria play a role in dealing with hemicellulose and cellulose in feedstuffs for use as energy in the aerobic phase thus accelerating the formation or polymerization of rumen microbes and accelerate the penetration of rumen microbes to degrade feed ingredients resulting in increased dry matter digestibility in feed ingredients. Similarly, Wulandari et al. (2014) state that feed fermentation with 0.05% level of SBP® can improve the in vivo digestibility of crude fiber.

Organic matter digestibility (OMD)

The same results are shown on the digestibility value of organic matter. The I5 treatment was significantly different ($p < 0.05$) from that of the other treatments. The digestibility value of the organic matter of each treatment were I0 (38.34%), I1 (39.04%), I3 (40.06%) and I5 (47.77%). The highest digestibility value of organic matter in the I5 treatment is caused by the increasing of dry matter digestibility value which affects to the digestibility of organic matter. The organic composition consists of fat, crude protein and nitrogen free extract (NFE). Sutardi (2003) states that the increase in dry matter ratios is always accompanied by the digestibility of organic matter ratios, since most of the dry material component consists of organic matter, the difference lies in the ash content and the factors that affect the high digestibility of the dry matter also affect the high digestibility of organic matter.

Furthermore, the researchers suspect the increase of organic matter digestion caused by the time of fermentation process of organic compounds contained in the crude fiber fraction at the complete feed consisting of cellulose and hemicellulose has undergone stretching of the bond and decomposition into simpler compounds due to cellulolytic bacteria. Such breaking and stretching help the rumen fluid microbes in the in vitro fermentation tube to secrete enzymes and digest the organic matter feed better. On the other

hand the use of high-energy feed ingredients such as tapioca waste and rice bran As well as a source of high protein palm kernel cake and Kumpai Minyak grass cause the availability of carbohydrates and protein high enough in complete feed and it affects the fermentation process by rumen microbes because carbohydrates are used as sources of energy and carbon source frameworks, whereas proteins are used as sources of nitrogen to form microbial proteins.

Table 2. Dry matter digestibility and organic matter digestibility of 7 days fermentation of complete feed based Kumpai Minyak grass

Digestibility	Treatments			
	I0	I1	I3	I5
Dry matter	41,76±0,76 ^a	42,32±1,35 ^a	42,72±3,02 ^a	51,84±1,15 ^b
Organic matter	38,34±0.60 ^a	39,04±1,76 ^a	40,06±2,46 ^a	47,77±1,06 ^b

CONCLUSIONS

Complete feed based Kumpai Minyak grass on 7 days fermentation with 0.05% level of SBP® can increase dry matter and organic matter digestibility.

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