Local Micro Organisms (LMO) as an Activator to Enhance the Quality of Various Plant Waste as Feed

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ABSTRACT: The assessment has been conducted at Gowa Station Research, Assessment Institute for Agricultural Technology (AIAT) South Sulawesi. The aim of this study is to investigate the type of Local Micro Organisms (LMO) as the best activator to improve the quality of agricultural waste as feed. The research activity consists of two stages: first, is the manufacture of the material LMO of six types: fruit of Calabash Tree (*Crescentia cujete*), fruits that have been wasted, chicken rumen contents, tricoderma, excrescence banana and vegetable wastes. The six types of materials made LMO, selected three types are considered to be the best that *Crescentia cujete* (LMO I), chicken rumen contents (LMO II) and vegetables wastes (LMO III). The selection of the three types of LMO is primarily based on the percentage content of N - total, the content of N is expected to increase the protein content of the waste material that is fermented. Although the content of elements of C - organic slightly lower than other LMO materials. Second activity, is the use of three types of LMO were selected in the first activities to be used in the fermentation activator 3 types of agricultural waste namely , rice straw, corn straw and sugarcane shoots. The results of laboratory analysis showed an increase in the nutritional quality of the before and after fermentation of the three types of sewage plants, so that from the third LMO was selected as the best activator is Calabash Tree (*Crescentia cujete*).

Keywords: agricultural waste, microorganisms local, feed, Calabash Tree, fermentation

INTRODUCTION

The determine factors the quality of a solution of LMO include fermentation media, the levels of raw materials or substrates, the shape and nature of microorganisms active in the fermentation process, pH, temperature, length of fermentation, and the ratio of C / N solution of LMO (Hidayat, 2006). The main ingredient in the manufacture of LMO consists of three components, among others: (1) carbohydrate; (2) glucose (3) the source of microorganisms. Source of carbohydrate can be derived from rice washing water, stale rice, cassava, potatoes, wheat, bamboo shoot, grass, and leaves of Gliricidia. For sources of glucose can be derived from brown sugar, liquid sugar, and coconut water, while as a source of microorganisms can come from snails, fruit peel, urine, and shrimp paste. Coconut water is a good medium for the growth of microorganisms during the fermentation process because coconut water contains 7.27% carbohydrates; 0.29% protein; some minerals, among others, 312 mg L-1 potassium; 30 mg L-1 of magnesium; 0.1 mg L-1 iron; 37 mg L-1 for SFOR; 24 mg L-1 of sulfur; and 183 mg L-1 chlorine (Budiyanto, 2002). Cow urine is used as a source of microorganisms in the manufacture of LMO, because livestock manure containing cellulolytic microorganisms that help the digestive process. Bacteria and fungi lignocellulolytic has an important role in the reform process fodder in the form of cellulose in the rumen (Wanapat, 2001) Population cellulolytic microorganisms thrive in ruminants fed forage with the main fiber. Liquid cow manure contains nutrients that are higher than solid cow manure.

MATERIALS AND METHODS

These assessment activities carried out at the experimental Gowa, BPTP South Sulawesi, Gowa. There are two phases of activities that have been implemented as follows: The first stage is making starter by utilizing local micro-organism (LMO) with raw materials consisting of 6 kinds of different types of materials, namely, fruit of Calabash Tree (*Crescentia cujete*), fruit that have been wasted, chicken rumen contents, excrescence bananas and vegetables that have been wasted, collected and subsequently becoming LMO except tricoderma been processed. The second phase is three types of LMO were selected in the first activities for fermentation of agricultural waste to improve the quality and durability of these materials as animal feed. Three types of LMO have been screened is, the fruit of Calabash Tree (*Crescentia cujete*) (LMO I), chicken rumen contents (LMO II) and vegetables that have been wasted (LMO III).The three types of LMO have been screened using for fermentation 3 types of agricultural waste, there were is, rice straw, corn straw and sugarcane buds. Parameters measured were fermented waste appearance, smell, texture and quality, and compositions of nutritional content. The results of laboratory analysis, the six types of materials made LMO shown in Table 1.

Table 1. Chemical composition of materials used as LMO

Material	Chemical Composition (%)			
	N-total (%)	P_2O_5 (%)	K_2O (%)	C-organic (%)
Calabash Tree	0.16	0.03	0.69	1.48
Fruits	0.09	0.03	0.71	1.95
Rumen contents of chickens	0.15	0.02	0.48	1.33
Tricoderma	0.14	0.005	0.004	0.46
Bananas excrescence	0.13	0.02	0.62	0.41
Vegetables	0.13	0.03	0.47	1.58

Results Soil analysis of Maros Laboratory, 2014

RESULTS AND DISCUSSION

Local micro-organisms (LMO) is a collection of microorganisms can be propagated, which serves as a starter in the manufacture of compost or as an activator in the fermentation of agricultural waste for animal feed. Utilization of agricultural waste such as fruit, vegetables and other unfit for consumption is processed into LMO could increase the added value of waste, and reduce environmental pollution. The six types of LMO which have analysis is best taken three types, namely Calabash Tree (LMO I), rumen contents of chickens (LMO II) and vegetables (LMO III), was then applied as an activator for the fermentation of agricultural waste are 3 types of rice straw, hay corn and sugar cane shoots. The selection of the three types of LMO is based primarily on the percentage content of N-total. From the content of N is expected to increase the protein content of the waste material that is fermented. Although the content of the element of C-organic there were slightly lower than other LMO material. In general, almost all the agricultural wastes containing high crude fiber, but with a touch of simple technology waste can be converted into nutritious feed and energy source for livestock. According to (Saswono and Arianto, 2006) that almost all waste food crops can be used for cattle feed ingredients. To further enhance the quality of the waste it is necessary to fermentation by using LMO (Purwasasmita, 2009) which can be easily obtained around our environment. Material that will be used LMO should have three components, namely,

(1) Source of carbohydrate (2) Source of glucose and (3) Source of microorganism. These three components are very large role in the fermentation process. The results of laboratory analysis showed that the nutritional composition of the three types of waste that has been fermented, shown in Table 2.

Table 2. Nutrients composition of fermented plant waste

Material	LMO Type	Nutritional Composition (%)				
		DM	FiC	PC	FC	TDN
Rice straw	I	32.87	21.78	9.46	2.17	66.49
	II	35.62	20.42	8.62	2.02	63.42
	III	32.73	24.36	8.31	1.86	60.78
Corn straw	I	25.23	21.30	10.04	2.59	60.98
	II	25.42	22.70	9.90	2.67	61.56
	III	26.55	23.64	9.67	2.55	60.67
Cane shoots	I	25.93	25.04	8.21	2.67	66.59
	II	26.53	25.22	7.45	2.78	65.34
	III	26.96	24.86	7.12	2.90	66.12

Description: LMO I: Calabash Tree, LMO II: The contents of the rumen chicken, LMO III: Waste vegetable

Some research has shown that the application of processing technology can improve the availability of nutrient byproduct of food crops at the same time simplify the storage, transportation (Muktiani *et al*., 2007; Sitorus *et al*., 2007). From the results of laboratory analysis (Table 3) shows the nutritional composition of the three types of agricultural waste are tested. Seen an increase in the quality of the waste after fermentation. These results are consistent with some previous results that basically agricultural wastes can be enhanced as animal feed with the fermentation process.

Table 3. Nutrients comparison of plant waste before and after fermentation

Material	Composition of Nutrition									
	Before Fermentation					After fermentation				
	DM	PC	FC	FiC	TDN	DM	PC	FC	FiC	TDN
Rice straw	31.87	5.21	1.17	26.78	51.49	33.74	8.79	2.02	22.19	63.56
Corn straw	21.69	7.66	2.21	26.30	58.24	25.73	9.87	2.60	22.54	61.07
Cane shoots	21.42	5.57	2.42	29.04	55.29	26.47	7.56	2.78	25.04	66.01

Description: Dry matter (DM), Protein Content (PC), Fat Content (FC), Fiber Content (FiC) and Total Digestible Nutrients (TDN).

At Table 3. that through the process of fermentation of the three types of waste such plants turns giving compositional changes highest nutrient is rice straw, is evident from the increase in crude protein content from 5.21% to 8.79%, the increase is almost 40%, more higher than those reported Mahendri *et al* (2005). Besides protein also Totan Digeble Nutriet (TDN) increased from 51.49% to 63.56% and a decrease in crude fiber content of 26.78% to 22.19%. The same thing as reported by Mahendri *et al.* (2005) that the crude protein content in the fermented rice straw increased while lowering the levels of ADF and NDF. Jamit Pasaribu *et al.* (1998) also reported that the fermentation process of the oil sludge using the A. niger can increase the levels of crude protein and pure protein and lower fiber content of oil sludge. Both elements, namely protein and crude fiber in addition to other elements very important role in the process of growing cattle, with high protein content in the feed will greatly affect the enlargement process and the growth of livestock, while the low crude fiber content will increase feed consumption and accelerate the process of digestion of feed that, as reported Marthong *et al.* (2014) that the sugarcane bagasse that has been fermented by as much as 6% Sodium hydroxide can improve the nutritional content of sugarcane as much as 42% and significantly affect digestibility of DM, NDF and ADF in dairy cattle. In general that agricultural waste contains high fiber, while the coarse fibers are lignin component difficult to digest specially in rice straw. Lignin on rice straw is poly aromatic polymer with high molecular weight and including lignin phenolic groups (Arroyo, 2000) which are resistant to enzymatic hydrolysis including fermentation by rumen microbes and alkaline (Hatakka, 2000). Thus, limiting the digestibility of cellulose and hemicellulose (a polysaccharide) as an energy source ruminant feed.

CONCLUSION

The six types of materials to make LMO, the best is made from fruit of Calabash Tree (*Crescentia cujete*) selected as the activator for the fermentation of rice straw, corn straw and sugar cane shoots.

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