Production of Liquid and Solid Organic Fertilizer from Tilapia Fish (Oreochromismossambicus) Wasteusing "Bakasang" Traditional Fermentation Technology

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ABSTRACT--- In previous study, the mixture of manure and sand have been tested successfully as media growth on local Jackfruit seedlings from Central Sulawesi, called Tulo-5 and Beka-3. It means that the organic fertilizers are a good fertilizer to use. One of organic fertilizer is Solid organic fertilizer (SOF) from Tilapia fish (Oreochromismossambicus) waste. The objective of this research is to make Solid Organic Fertilizer (SOF) through 'the Bakasang Fermentation Technology"(BFT) produced Liquid Organic Fertilazer (SOF), as a part of a local wisdom in North Sulawesi area. Both products have been analyzed macro nutrient of N,P,K elements by certain method and micro nutrients of Zn, Mn, Fe, Cu, Ni, Co elements by spectrophotometry method. Both products are not meet requirement of selling LOF and SOF especially or level of Nitrogen (12%). On the other hand for a day necessity of plant feeding (1.5 ppm), both kind of fertilizer are still the most.Index Terms - Big Data, MapReduce, MRBIG, Top-k. Dominance

Keywords - Liquid solid organic fertilizer, Tilapia waste, Bakasang fermentation.

INTRODUCTION

In terms of agro ecological aspects, Jackfruit plant are well growth inPalu Valley and geographically. In terms of taste, jackfruit from Palu is more crunchy and sweet then from other area of Indonesia. Opportunities to lift up jack fruit from Palu as a superior commodity are open wide.One of opportunities is a potential accessibility ofPalu as capital city and the center of economic growth of Central Sulawesi Province[1]

The idea of this research was looking for organic fertilizer to grow of superior jackfruit from Palu, Tulo-5 and Beka-3. It is based on previous study that organic planting media made from manure can provide the best seed vigor results for superior jackfruit Tulo-5 and Beka-3,[2]. The continuing good grow of jackfruits depended on organic fertilizer.

Therefore from the local wisdom and abundance of resources point of view, the choice of tilapia waste as source of fertilizer is necessary reason to be taken with some consideration, as below:

Every day, people of Palu City and surrounding areas meet the needs of protein from various sources, including by consuming fresh water fish that found many surround as tilapia fish. The main source of tilapia fish is from Lake Lindu (2.500 m from sea level. The unique of selling tilapia by local seller is to clean fish on stage, separating between clean fish with intestine, fins and scales.

According to Davis,2004,[3] fish can be used as a material to make liquid fertilizer or solid fertilizer. Added by [4], fertilizer with fish raw material can increase yield of some type of fruit plants up to 60% . There are several other benefits that can be obtained if using fertilizer with fish raw materials as described by Galgosa 2007,[5] which can decrease the attack of macrophominaphoseolina, Rhizoctoniasolani and Fusariumspp pathogens in okra and long bean plants. Abbasi 2003,[6] shows that LOF stimulated the development of Actynomicetes spp. And Rhizobacteriaspp that play a role in producing hormones grown around rooting plants.

As we know, to grow and develop, plants need complete nutrition and macro nutrient form consisting of primary macro such as N-P-K, as well as secondary macro such as Ca (calcium), Mg (magnesium), and S (sulfur). While micro nutrients consist of Fe (iron), Zn (zinc), Cu (copper), Mn (manganese),and Cl (chlorine).

Others local wisdom is the process of fermentation used in this research was through fermentation with simple method that has grown in the community (local wisdom) as in the manufacture of fermented sauce of the fish's stomach so call "bakasang", from North Sulawesi. In this research is called "Traditional Fermentation Technology".

So, this paper will report nutrients analysis on liquid fertilizer from tilapia fish waste (intestine, fins and scale) after fermentation process.

PROBLEM STATEMENT

Base on background in introduction that Problem Statement of research is: can Bakasang Traditional Fermentation Technology be usud to product of liquid and solid organic fertilizer from Tilapia Fish (Oreochromismossambicus) Waste ?. To know success of the production was by analized level of macro and micro nutrients.

THE AIM OF RESEARCH

Revised Manuscript Received on 14 February, 2019.

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The aim of this resear is to produceliquid and solid organic fertilizer from Tilapia Fish (Oreochromismossambicus) Waste using Bakasang Traditional Fermentation Technology and thananalising level of macro and micro nutrients.

METHOD OF RESEARCH

10 Kg of Fish Samples from Lake Lindu produced offal waste and fermented by bakasang traditional fermentation technology for 15 days. Molasses consist of tomatoes and brown sugar as a food source of bacteria was mixed, and then dissolving dry flour scales and fins. Therefor the total sample weigh was approximately 1494.18 g. Furthermore, this product is called Liquid Organic Fertilizer (LOF).

To determine the level of nutrients wastaken 100 grams ofLOF sample mixed with 20 mL of concentrated HNO_3 heated for 10 minutes at 60°C, filtered and ready to be analyzed.

To make Solid Organic Fertilizer (SOF) wasmixed between sample of LOF with clay (b / b), with a ratio of 1: 1 printed in a pellet machine and than air dried.

Nutrient Analysis.

Nitrogen Analysis: Then for nitrogen analysis taken 3 gr + 10 mL H2SO4 + ½ Keldhal tablets.

Phosphorus analysis as P2O5: analyzed by wet blinding (HNO3 + HClO4, molibdovanadate) measured with a UV spectrophotometer.

Analyzing other nutrient levels of LOF or SOF wasby taken100 grams was mixed with 20 mL concentrated HNO_3 heated for 10 minutes at 60°C. filtered and ready to be analyzed.

Dilutation was done by taken 5 mL to 500 L volumetric flask.

Nutrient analysis using AAS: Zn, Mn, Cu, Fe, Cl, K, Ca, Mg, N, P

The wavelength of the measurement corresponds to the precision of the tool: Zn: 213.9 nm, Mn: 279.5 nm, Cu: 324.7 nm, Fe: 243.3 nm, Ca: 422.7 nm, Mg: 285.2 nm, K: 766.5 nm.

Furthermore, the concentration of specific measurements for each element.

Measurement of sample concentration can be calculated using standard solution concentrations.

Analyse by flame photometry.

Wash out a 5 mL bulb pipette with a little of the sample stock solution, and add 5 mL of the sample stock solution to each of five 50 mL volumetric flasks.

Wash out a 5 mL graduated pipette with a little of the 100 ppm Kstock solution, and add to these five flasks, 0, 1.50, 2.50, 3.50 and 5.00 mL of the 100 ppm standard K solution.

Make each up to the mark with Milli-Q water, and stopper and shake to homogenise each solution.

These solutions have added to them 0, 3, 5, 7 and 10 µg per mL, or ppm.

RESULT AND DISCUSSION

In the manufacture of LOF, some modifications of basic procedure of fermentation were made in order to obtain better result and in order to adapt the bakasang procedure as local wisdom from North Sulawesi, K shape island in meddle of Indonesia. This project base on local wisdom of house lady throw fish water cleaning to fertile chili in pot.There were many study related to this issued, many application already successes.

Organic waste does not robbed the soil fertility and have resulted in health and environmental hazards and no contain toxins or carcinogenic materials.[7] It can improve the soil structure, water holding capacity, microbial biomass, and nutrient availability. [8] Hence, by recycling the organic wastes as fertilizers, trough the simple processes helps farmers or house lady to have simple and good quality fertilizer. So the way for sustainable solid waste management and agriculture will be on the tract.

Knowing that the problem of fish waste cause smell everywhere specially in Palu city, which is every house hole eat fishes as sources of protein and throw the fish waste in temporary legal or illegal waste disposal. So transforming them in to useful products like fertilizers is the wise solution due to rich of essential macro and micronutrients.[9] Fermentation of the fish waste to be liquid fertilizer is the right method and easy way to have get carbon source, moisture and aeration were provided in right proportion.The investigation on the yield of many vegetables and fruits used fermented fish waste as liquid fertilizer has been done.[10], 11]

The process of fermentation was done smoothly which some procedures; fish samples from Lake Lindu 10 Kg each produce waste offal, then fermented as in the working procedure 15 days and in offal, fins scale previously dried in sunlight for 15 day and in the oven until it is easily crushed into flour.

Once fermented all the fermentation process goes well, it is proven at the beginning of a dense mixed process of wet colored blood / brown blackish, after the fermentation becomes reddish brown liquid with a strong odor (not the smell of carcass).

PUSDIK KelautandanPerikanan said in fermentation of fish was occurred breakdown of protein, fat and other components. Especially the protein is hydrolyzed into its derivatives, such as proteases, peptones, peptides and amino acids.

The process as well produced fragrance component or volatile compound composed of 16 kinds hydrocarbon compounds,7 kinds of alcohols, 46 kinds of carbonyl, 7 kinds of fat, 34 kinds of nitrogen compounds, 15 kinds of sulfur compounds, and other compounds as many as 10 kinds. These compounds will, among other things, produce ammonia odors, sour, rotten, savory and other distinctive smells.

The presence of different odor component caused LOF have a distinctive odor/aroma according to the area of origin and the process of manufacture.

At that stage the enzyme from fish body tissue, that plays a role and also enzyme produce by microbes. Proteolytic enzymes contained in fish body tissue

are mainly found in the gastrointestinal tract, namely the portion of the pyloric caecum and intestinal mucus. Proteolytic enzymes from bacteria are mainly produced by halophilic bacteria.

The presence of water leads to the process of breaking down fat into fatty acids and glycerol can work well. The active lipase enzyme can be derived from muscle and adipose tissue, also from bacteria.

After all the fermentation processes done followed by the extract of nutrients by reacting with 20 mL concentrated HNO_3 stirred heated for 10 minutes at 60° C. Because of too concentrated, result of extracted was diluted from 5 mL to 500 mL, and then was taken certain amount of each sample to be analyzed.

RESULTS & DISCUSSIONS

Tabel 1: Materials used in the manufacture of LOF and chemical analysis of nutrient conten

Parameter	LOF_{2017}	LOF_{2018}	SOF_{2018} Tanah Liat
Intestine (gr)	718.331	2308	2308
Scales&fins (gr)	84.590	549.89	549.89
Tomato(gr)	152,67	461	461
Palm Sugar (gr)	38,16	230	230
Zn (mg/L)	15.5	63.96	80.29
Mn (mg/L)	18.8	68.45	150
Cu (mg/L)	40	44.4	45
Fe (mg/L)	17.7	19	16
Ca (mg/L)	404.1	435.4	455.0
Mg (mg/L)	77.2	100.4	99.10
K (mg/L)	90.8		
N(%)	1,2	1.57	0.013
P(%)	0.1		
Co(mg/L)	eror	eror	eror
Ni (mg/L)	eror	eror	eror

*Data from the experiment.

Most of the results shows in table 1 were analyzed by AAS

There were some data need to be discuss. Sample from L.Lindu, in level of every nutrient has greater than sample from Kabonena. In terms of amount of solution, sample A1 less than A2 and it is so for B1 less than B2 for the level of nutrient.

Cobalt and nickel was not found in both sample. From the simplicity and the level of nutrient, the fermentation processes without adding of molasses better than the fermentation processes with adding of molasses. But If sample A1 and B1 were extracted the amount of molasses and salt and acid, it will be the same.

The result can be compare to some study before such as;

In Vanny, 2017[12] shows waste fish talapia has high content of calcium and phosporus on the fins and scales. Hepsibha 2014[13] said the proximate trace elements present in Gunapaselam (Fermented Fish waste) are shown in.[14] The level of micronutrients in Gunapaselam is Zn (3.21±0.32), Mn (1.34±0.10), Fe (15.69±1.36), Cu (0.55±0.05), Pb (0.69±0.06), Ni (Below detectable limit) and B (1.76±0.14) (mg/Kg). The amount of sculpture and sodium were 0.04±0.00 and 0.07±0.00 (%) respectively.

It means that the result of this study relatively the same. It is enough for fertilized the crops as said by reference [[14]

Table 2. Report from a comprehensive soil test with recommendations for a mixed vegetable garden.[14].

Soil Test Results		Interpretations	Recommendations
Texture	Sandy Loam		
Lime	++	Normal	
pH	7.7	Normal	
Salinity - ECe mmhos/cm	0.4	Normal	
Phosphorus - P ppm	11	Low	1-2 lbs P2O5/1000 sq ft
Potassium - K ppm	82	Low	2 lbs K2O/1000 sq ft
Nitrate-Nitrogen - N ppm	1.5		2-4 lbs N/1000 sq ft
Zinc - Zn ppm	1.2	Adequate	0 oz Zinc/1000 sq ft
iron - Fe ppm	7.9	Adequate	
Copper - Cu ppm	0.4	Adequate	
Manganese - Mn ppm	1.8	Adequate	
Sulfate-Sulfur - S ppm	13.0	Adequate	0 lbs Sulfur/1000 sq ft
SAR			
Organic Matter %	3.2		

CONCLUSION

In conclusion, from the study that the bakasang fermentation can be fermentation models used for produce Liquid and Solid Organik Fertilizer from tilapia fish waste.It can be proven by successfully of fermentation processes and the level of nutrient found in, especially micro nutrient are meet the requirement of fertilizer

Some things that can be concluded through this research; first nutrient content of both primary and secondary macro nutrients as well as micro elements have been measured in this study against LOF and SOF of Tilapia fish waste with fermentation process. From the existing literature the content is able to meet the needs of the plant's daily needs [14]. Secondly, it can be concluded also that the process of making LOF can follow the procedure of making "bakasang" or Traditional Fermentation Technology. It can also add salt and orange juice as a preservative and deodorizing. Third, to increase the nutrient content can be increased by reducing water or by making pellets or Organic Solid Fertilizer (POP). Finally, to meet the requirements of FAO standards for LOF to sell (12% N), it is necessary to add extract sources of nutrient-rich organic materials.

ACKNOWLEDGEMENTS

First acknowledgement is for DIKTI to support by research grand.Thanks for all the students as companion of research program of DIKTI.Thanks to Government Palu City, specially for waste Management Office fortheir support.Finaly thanksto Tadulako University for

supporting the place to conduct this research.

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