Journal of
Computational and Theoretical Nanoscience
Vol. 16, 5166–5170, 2019

RESEARCH ARTICLE

Liquid Waste of Palm Oil Plantations as Liquid Fertilizer

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The purpose of this study was to test the potential for sewage treatment plants Milt Palm Oil Waste (POME) as a raw material Liquid Fertilizer. Palm Oil Mill Effluent samples taken of Oil Palm Plantation PT. Minanga Ogan, South Surnatra method of analysis used for BOD Winkler method, a method Kjehdahl Nitrogen, Phosphorus appears spectrophotometer method, K by Atomic Absorption Spectrophotometer methods and MLSS (Mixed Liquor Suspended Solid) by using the gravimetric method. The results of this study indicate an anaerobic 20,1471 BOD, 25 mg/L, N 1021.22 mg/L, P 328.19 mg/L, K 541.03 mg/L, and MLSS 136 mg/L BOD anaerobic ponds 2,18,421, 16 mg/L, N 876.35 mg/L, P 279.24 mg/L, K 473.59 mg/L, and MLSS 154 mg/L BOD Anaerobic an 11428,213 mg/L, N 662.61 mg/L, P 238.32 mg/L, K 348.26 mg/L, and 163 MLSS anaerobic ponds mg/L BOD 4522.81 4 mg/L, N 443.26 mg/L, P 102.22 mg/L, K 327.76 mg/L, and MLSS 198 mg/L. According to Minister of environment of the Republic of Indonesia Number 29 Year 2003 on Use of Palm Oil Technical Guidelines, the Board of Directors 3000–5000 mg/L does not pollute the environment but still have enough nutritional value for plants. It can be concluded that the anaerobic pond 4 can be directly used to, liquid fertilizer. While anaerobic pond 2 and 3 should be treated as liquid fertilizer raw materials as BOD of anaerobic Both pools are quite high.

Keywords: Palm Oil Mill Effluent (POME), Liquid Fertilizer.

1. INTRODUCTION

Conventional Fertilizer Needs lately has increased so that the heat is covered by the farmers, except that there are negative effects of chemical fertilizers on the environment. One of the efforts is to use the example of the local use of local resources Resource South Sumatera, namely Palm Oil Mill Effluent (POME). Waste is not a problem to be avoided or covered treatment, waste also have economic value concept of 3R (Reduce, Recycle, Recovery) will push each manufacturer to make waste bins have economic value. Processing of Fresh Fruit Bunches to Crude Palm Oil to produce large amounts of biomass by-products. In 2004 the volume of oil by-products amounted to 12,365 million tons of Oil Palm Empty Fruit Bunch, 10,215 million tonnes of mussels and fiber, and 32,257–37,633 million tons of Palm Oil Waste Mitt (POME). This number will continue to increase with the increase in production of FFB Indonesia. Production of Fresh Fruit Bunches Indonesia in 2004 reached 53,762 million tons and in 2010 was estimated at 64,000 million tons [1–3]. Results Oil Mill Research Center showed that factory Palm Oil Plantation is the result of efficient enough 0.6–0.8 m^3 Palm Oil Mill Effluent/ton FFB processed. For example, in reasonable condition, total volume. Palm Oil Mill Effluent, with a capacity of 30 ton TBS/hour to operate 20 hours per day will process 600 tons of TBS/day. Liquid waste will be treated at a sewage treatment facility next river discharge into water bodies. Milt Palm Oil Waste (POME) can be used for fertilizer on farmland thought the land application of certain conditions POME contains nutrients that can be used for crops. According to the Decree of the Minister of Environment of the Republic of Indonesia Number 29 Year 2003 on Use of Palm Oil Technical Guidelines, BOD of 3000–5000 mg/L in order not to pollute the environment, but still has enough nutritional value to the plant. Nutritional content in 1 m^3 POME BOD5 have about 5000 mg/L is equivalent to 1.5 kg of urea, O.3 KGSP-36, 3.0 kg and MOP fertilizers 1.2 kg Kieserit. Palm Oil Mill Effluent with a capacity of 30 tons/hour will generate approximately 480 m^3 of liquid waste/day, so the area can be applied to waste is 100–120 hectares (www.primatama.litbang.depian.Go.id). Palm Oil Mill Effluent (POME) contain macro nutrients like N, P, and K required by palm trees. So that by the application of POME soil (soil application) fertilizer. The substance can save the cost of the use of macro nutrients contained in POME comparable quantity of organic material contained in POME comparable estimate of the

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 1546-1955/2019/16/5166/005 doi:10.1166/jctn.2019.8580

amount of N, P and K are closely related to the content of BOO in the POME [4]. According to the Czech environment minister's decision Indonesia. No 28 Year 2003 on Technical Guidelines Utilization Rate Industrial POME POME Palm Oil Plantation in the palm oil industry can be applied to the soil if the BOD ranging from 3000–5000 mg/L percentage of the nutrient content is relatively high in inorganic fertilizer so farmers tend to use fertilizer. But lately, the higher the price of the organic fertilizer. This of course adds to costs for farmers. In addition to inorganic fertilizers can cause dependence and can bring adverse effects, such as land so damaged by excessive and continuously will cause the soil to be loud, polluted water, and the balance of the soil is disturbed. To overcome this research needs to turn waste into something useful. One of them specifically harnessing waste organic waste for fertilizer raw material liquid in order to reduce the accumulation of waste and can help farmers in providing fertilizer [5]. During this compost produced from organic waste in solid form abundant. But rarely is a fluid, in more practical terms the waste is used as fertilizer because the manufacturing process is relatively inexpensive, and the production cost is not a big 100. The raw material is an excellent organic fertilizer from organic waste material wet organic or organic materials that have a high water content such as waste oil. Apart easily prepared, this material is also rich in nutrients needed by plants. The contents greater than cellulose and organic matter (C ratio I N), the process of decomposition by bacteria takes longer. Based on this, researchers are interested in knowing the use of Palm Oil Plantation. Liquid fertilizer can be treated with sewage several variables palm oil mill with nutrients N, P and K from various BOD which is expected eventually to know one of the values of the above parameters, predictable value of BOD waste water, or otherwise concerned with knowing the value of BOD can be predicted N, P, and K and Palm Oil Mill Effluent. Probtem formulation, Palm Oil Mill Effluent treated BOO typically have about 25,000 mg/L Palm Oil Mill Effluent containing suspended solids and oils with a high level. Solid, if inflows generics will settle, slowly decompose, consuming oxygen in the water, emit an unpleasant odor [6, 7]. Alternatively, solids and oil floats on the surface of the water so that the refuse aeration (oxygen supply) and affect aquatic life (PPKS Field). Palm Oil Mill Effluent with BOD content from about 25,000 mg/L. COD 50,000 mg/L indicates that the compound Palm Oil Mill Effluent is a biodegradable organic matter. Waste pH of about 4.0 to 4.9 (acid) which need further processing of organic waste that can be processed at maximum in a neutral pH. (pH suited to decomposing bacteria). To leverage the efforts of Palm Oil Mill Effluent be done to treat and recycle wastewater in a manner characteristic analysis of Palm Oil Mill Effluent thus improving the nutritional content of N, P, K and conversion of waste into liquid fertilizer, so that waste water can improve the quality of land and palm oil production, efficiency so expect and understanding as waste materials become contaminated materials can be used to apply our natural resources and become Objective competent, Knowing the quality of the Palm oil Mill Effluent pond reservoirs, each pool Analyzing the characteristics of the reservoir, looking for the optimum conditions for BOD, N, P, K and MLSS for use as fertilizer [8, 9]. The benefits of this research is to provide a wastewater treatment solution Palm Oil Mill Effluent organic fertilizer liquid, overcoming environmental pollution by reducing, recycling, recovery and reuse (R4), can reduce the cost of waste treatment Oil Palm Plantation.

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2. MATERIALS AND METHODS

2.1. Time and Location Research

The study was conducted in the laboratory with the Environment and Land Laboratory University of Muhammadiyah.

2.2. Research Methods

This research is an experimental laboratory. By using the analytical methods for BOD Winkler, Kjedhal method for Nitrogen, Phosphorus visible light spectrophotometer Phosphorus, and Atomic Absorption Spectrophotometer method for potassium, the gravimetric method for MLSS (mixed liquor Suspended Solid). Sampling Palm Oil Mill Effluent PT. South Sumatra, Ogan Minanga anaerobic ponds 1, 2 anaerobic ponds, pools and ponds anaerobic Anaerobic 3, 4.

2.3. Ingredients

Materials-Chemicals and samples of the materials used and the specifications are as follows: starch, Ammonium Chloride, Ammonium molybdate, ascorbic acid. Boric Acid, Nitric Acid Sulphuric Acid, Ferric Chloride heptahydrate, potassium phosphate Dhidrogen, Dhidrogen Potassium Phosphate, Potassium Iodide, Manganese Sulfate Mercury iodide monohydrate, Sodium Hydroxide, Sodium azide, Waste Water Samples Oil Palm Plantation [10].

2.4. Tools

Pyrex Glass Equipment, Bottle Wmkle; Buret, Incubator, isotermis City, Kjehdahl Pumpkin, Pumpkin Relluks, electric heating, Coofing, PH meter, Bioreactor Tube, Mixer, Filter.

3. RESULTS AND DISCUSSION

3.1. The Physical Characteristics of Palm Oil Mill Effluent

Analysis results Milt Palm Oil Waste in each pool for liquid manure into changing physical properties. Analysis of Oil Palm in pools 1 and 2 brown, very smelly and foaming due to the influence of microbes. Outdoor color

3 deer, odorless and slightly frothy [11]. And with four dark brown color, a bit smelly and a bit frothy due to the influence of microbes that turn color.

3.2. Palm Oil Mill Effluent Characteristics

3.2.1. Value Relationship Bodin Anaerobic Ponds

Waste Oil Palm contains 25,000 mg BOD of about 11. Based on an analysis of each reservoir, BOD containing mixed. We can see in Figure 1.

Seen from Figure 1 that the value of BOD in an anaerobic 1, 20147.25 mg/L, anaerobic ponds 2, 17421.16 mg/L, with Anaerobic 3, 10428.27 mg/L and anaerobic 4, 4622.81 mg/L decreasing. According BOD of each pool will be reduced as a result of the decomposition of organic matter due biodegradation activity of bacteria such as lactic acid, acetic acid, pirenat, organic acids derived from the decomposition of carbohydrate protein and fat.

3.2.2. Relationship Value Nitrogen in Anaerobic Ponds

Waste oil palm plantation Nitrogen water will exist as organic nitrogen and ammonia nitrogen. Total Organic Nitrogen Ammonia Nitrogen plus the amount already present in the solution. Based on an analysis of each reservoir pool Nitrogen has a variety of content. We can see in Figure 2.

Seen from Figure 2 that if the value of *N* in an anaerobic 1, 1021.22 mg/L, with a anaerobic 2, 876.35 mg/L, with anaerobic 3, 662.61 mg/L and anaerobic 4, 443.26 mg/L that the element nitrogen has decreased in each pool. According Notohadiprawiro, a decrease in the value of *N* is caused by Nitrogen changes the activity of microorganisms for the metabolic activity of living. Anaerobic pond 3 has the opportunity to be treated as a source of fertilizer to add nutrients to the plants, based researchers conducted a study on anaerobic pond 3 at 662.61 mg/L for liquid fertilizer raw materials [12].

3.2.3. Relationship Value Phosphorus in Pond Anaerobic

Phosphorus containing palm oil waste water contains compounds Ortopospat, Poliposfat and Posfatorganis. Each phosphate compounds present in dissolved form,

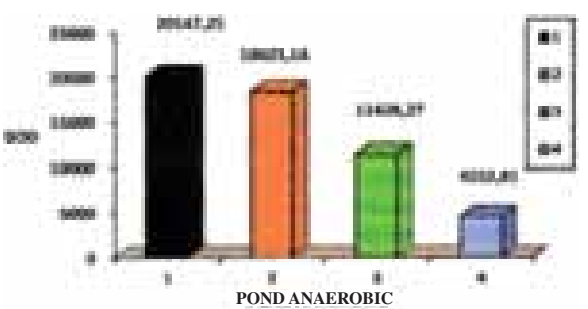

Fig. 1. Relationship between BOD value with free anaerobic.

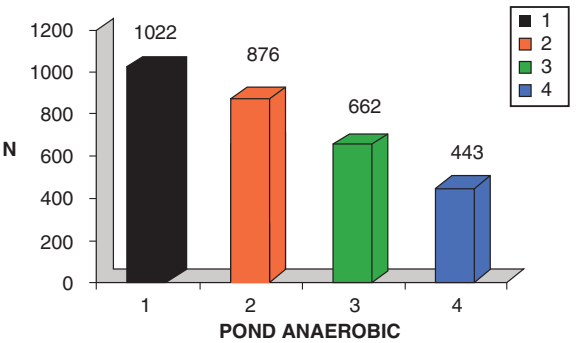

Fig. 2. Relationship between *N* value with free anaerobic.

suspended or bound in the cells of organisms in the water. Based on the physical properties of dissolved phosphorus, phosphorus is suspended (not dissolved) and Total Phosphorus (dissolved + deferred). Phosphorus compounds into depending analysis on the needs and circumstances of the examination body of water. Based on an analysis of each pool, phosphorus-containing diverse. We can see in Figure 3.

Seen from Figure 3 that value anaerobic Phosphorus 1, 328.19 mg/L, with a anaerobic 2, 279.24 mg/L, with anaerobic 3, 238.32 mg/L, and anaerobic 4, 327.76 mg/L. Viewed from each pool element phosphorus decreased. According Notohadiprawiro, a decline caused by an overhaul Phosphorus Phosphorus by the activity of microorganisms for the metabolic activity of living.

3.2.4. Relationship Value Free Potassium in Anaerobic

Potassium is a very important element for the formation of proteins, carbohydrates and also strengthens the plant stem, flowers and fruits that do not fall Flaeder research and Megel. If the element deficiency [\potassium will cause the plant's leaves will dry and shrink or raised red sports brown, long dry up and die. Fruit shape will not be perfect, small and not of good quality. Based on an

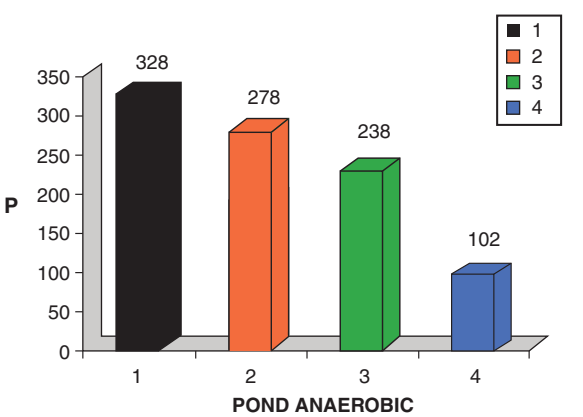

Fig. 3. The relationship between phosphorus value with free anaerobic.

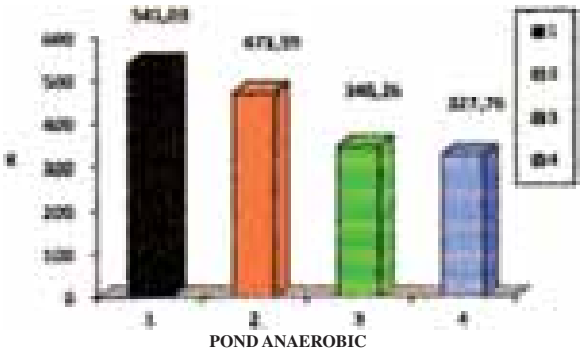

Fig. 4. Relationship with pond anaerobic *K* values.

analysis of each reservoir pool Potassium has a variety of content. We can see in Figure 4.

Seen from Figure 4 that the value of *K* in the pool anaerobic 1, 541.03 mg/L, with a anaerobic 2, 473.59 mg/L, with anaerobic 3, 348.26 mg/L and anaerobic 4, 327.76 mg/L. From figure seen that a slight decrease of 5% potassium value of each pool 1 to the 2 pools, 2 swimming pools to 3, and a 3 to 4. According to the results of the activity of microorganisms living activities that remodel potassium Metabolism expected.

3.2.5. Relationships Mixed Liquor Suspended Solids Values in Pond Anaerobic

Based on an analysis of each pool containing diverse anaerobic MLSS. Increased MLSS is because the process of Palm Oil Mill Effluent containing organic material in an anaerobic biodegradation of compounds that have become a simple acid. We can see in Figure 5.

Judging from the number 5 that the MLSS in anaerobic pond 1, 136 mg/L, with a anaerobic 2, 154 mg/L, with anaerobic 3, 163 mg/L, and anaerobes 4, 198 mg/L. According Jenie and Rahayu the increase MLSS of pool 1 4 pools caused by the activity in the breakdown of organic nitrogen into ammonia.

Judging from Figure 6 that if the stock is low, the Board of Directors or nutrients N, P, and K contained in each pool will decrease, because the process of waste water

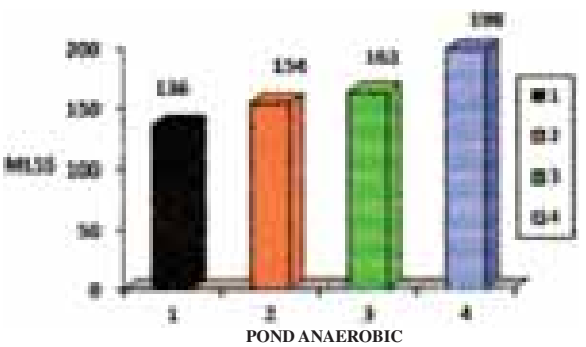

Fig. 5. Relationship between the MLSS and anaerobic.

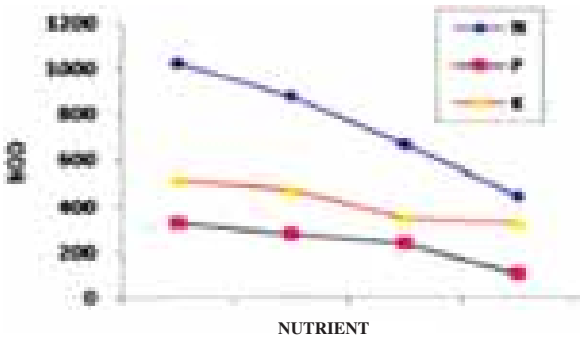

Fig. 6. The relationship between the values of BOD with nutrients (NPK).

containing organic materials in an anaerobic atmosphere biodegrasi compounds into simple acid.

4. CONCLUSION

Each pool can happen if BOD decreases, these nutrients also decreased due to decomposition of organic matter in the expected results of the activities remodel Directors of microorganisms and nutrients NPK for the metabolic activity of life and MLSS increase, it is because of process waste water containing organic material in a compound which has become acidic anaerobic biodegradation is simple. The potential of oil palm waste water is chemically derived from the results of each pool after analyzing the characteristics of the waste water in the oil palm plantation can produce BOD values in an anaerobic 1, 20147.25 mg/L, with a anaerobic 2, 17421.16 mg/L, with anaerobic 3, 10428.27 mg/L and anaerobic 4, 4622.81 mg/L, the value of *N* in an anaerobic 1, 1021.22 mg/L, with a anaerobic 2, 876.35 mg/L, with anaerobic 3, 662, 61 mg/L and anaerobic 4, 443.26 mg/L value *P* anaerobic pond 1, 328.19 mg/L, with a anaerobic 2, 279.24 mg/L, with anaerobic 3, 238.32 mg/L and anaerobic 4, 327.76 mg/L value of *K* in the pool anaerobic 1, 541.03 mg/L, with a anaerobic 2, 473.59 mg/L, with anaerobic 3, 348.26 mg/L and anaerobic 4, 327.76 mg/L MLSS value anaerobic pond at 1, 136 mg/L, with a anaerobic 2, 154 mg/L, with anaerobic 3, 163 mg/L, and anaerobes 4, 198 mg/L. With the BOD, COD (3000–5000) does not always produce the raw material to make a good liquid fertilizer according to SNI and vice versa. Results of anaerobic pond 3 will be used as raw material for fertilizer BOD value 11428.26 value of mg/L of nitrogen (N) was 662.61 mg/L, the *P* value was 238.32 mg/L, the value Potassium is 348.26 mg/L and MLSS is 153 mg/L and with four of observations can be directly used as fertilizer.

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Received: 1 January 2019. Accepted: 11 March 2019.

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