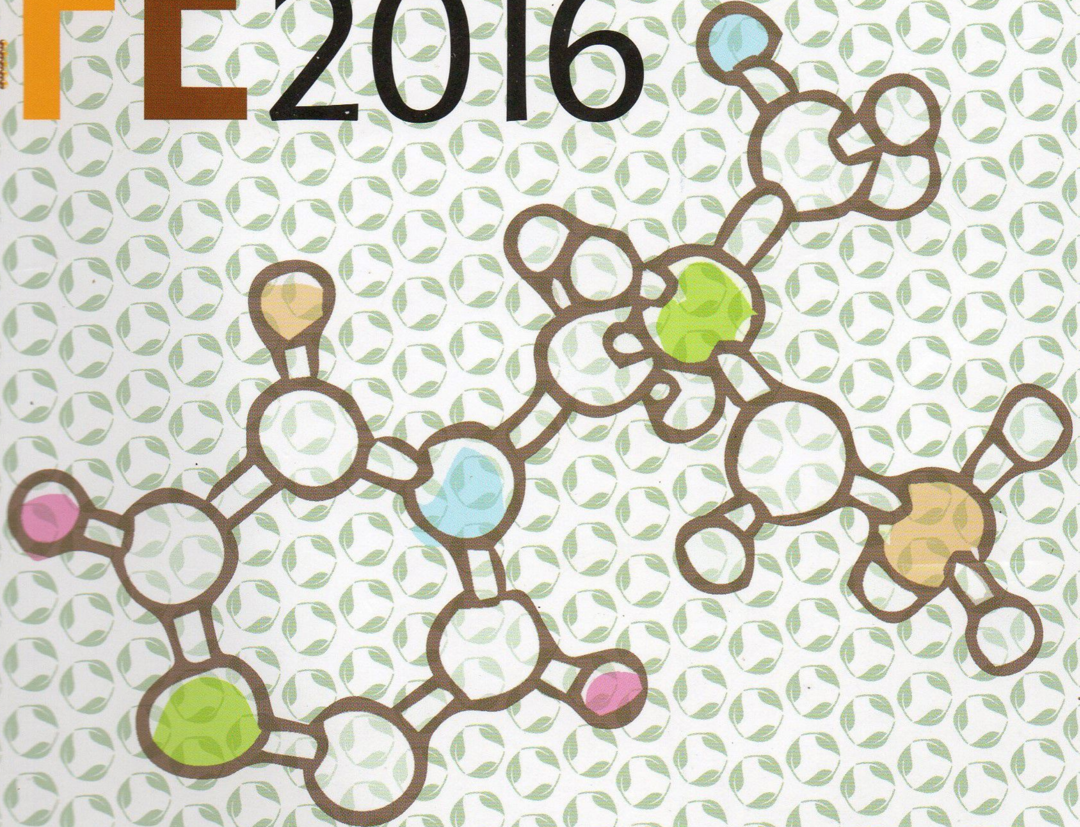
4th International Conference
Sustainable Agriculture, Food and Energy

Conference Programme
Papers Abstracts

Transforming Awareness of the Importance of Sustainability through Joint Action

SAFE 2016



SAFE Network
Asia Pacific Network for Sustainable Agriculture, Food and Energy

4th International Conference
Sustainable Agriculture, Food, and Energy
SAFE2016

October 20-22, 2016
Berjaya Hotel Colombo, SRI LANKA

"Transforming Awareness of the Importance of Sustainability through Joint Action"

Organized by:

University of Ruhuna, Sri Lanka

ANDALAS UNIVERSITY- INDONESIA

SAFE Network
Asia Pacific Network for Sustainable Agriculture, Food and Energy

"Home for connecting people for a better future of life"

Date : 22nd September, 2016
Ref. No. : 226/SAFE-Network/SAFE2016/2016
Registration No : 2016-215

Ketut Irianto
Agriculture Faculty, Warmadewa University. INDONESIA
Email: iriantoketut@yahoo.co.id

Dear colleague,

Acceptance to present a paper for the conference

Thank you for submitting an abstract entitled:

THE ROLE OF STEM BACTERIA (*METHANOBACTERIUM FORMICIUM*) IN TECHNOLOGY PROCESS ON BIO GAS PRODUCTION

for the International Conference-Sustainable Agriculture, Food and Energy (SAFE2016).

We are pleased to inform you that the committee has decided that your paper has been accepted for **oral presentation** in this conference. The full paper is optional. If you want to publish your paper in **IJASEIT Journal (Indexed by SCOPUS),** you must submit an original and unpublished full papers through the 4rd International Conference Sustainable Agriculture, Food, and Energy (SAFE2016) using EasyChair for SAFE2016 Submission System at http://safe2016.safetainability.org or by e-mail to: safetainability2013@gmail.com.

Your manuscript is strictly limited to 4-10 pages of A4 paper in single space using Template_SAFE2016. The deadline for full paper submission is 15th September 2016.

Thank you very much and looking forward to seeing you in Colombo!

Prof. P. Mangala C. S De Silva
Department of Zoology
Faculty of Science
University of Ruhuna
Matara
Sri Lanka

Prof. Dr.P.Mangala C.S.De Silva
Local Conference Coordinator

Dr.Novizar Nazir
Executive Chairman of SAFE 2016
SAFE-Network Coordinator

Please print and bring with you to the conference

Event **International Conference Sustainable Agriculture, Food and Energy 2016 (SAFE 2016)**	SAFE 2016 - International Conference Sustainable Agriculture, Food and Energy
Date+Time Thursday, Oct. 20, 2016, at 9.00 am-18.00 pm : Colombo City Tour Friday, Oct 21, 2016, at 08:00 am-17.00 pm (Conference) Saturday, Oct. 22, 2016, at 8.00-12.00 am (Conference)	
Location **BERJAYA HOTEL, Colombo-SRI LANKA**	**KETUT IRIANTO** **/Dr**
Event Management SAFE Network Asia Pacific Network for Sustainable Agriculture, Food and Energy	**Affiliation** **WARMADEWA UNIVERSITY INDONESIA**
Payment **US $ 100.00 (Non-Student)** **US $ 70.00 (student)**	**Registration Number 2016-215**

All payment must be completed by **September 15th, 2016** through wire transfer to: BNI CABANG PADANG. Account Name: AISMAN
Bank Address: JL. DOBI PADANG- Account Number: 0078008192
SWIFT CODE: BNINIDJAXXX

Official Website:
http://safe2016.safetainability.org

THE ROLE OF STEM BACTERIA (METHANOBACTERIUM FORMICIUM) IN PROCESS TECHNOLOGY FOR MAKING BIO GAS

Ketut Irianto
Agriculture Faculty, Warmadewa University
Email: iriantoketut@yahoo.co.id

Abstract

Object of this research is the role of microbes by using technology systems bulk (bulk). produce bio gas. The subject of this research is the forest conservation area in the village of Marga Tabanan, Bali Province. The analysis showed the average composition of bio-gas CH4 50-75, 27-40 CO2, H2 1-10, N20,5-3, -1 H2S, CO 0.1 and O2, NH3. This study began 20 February 2016 to August 28, 2016. The biological treatment is given at each stage starting from the technological process (decomposition, fermentation, mineralization) ie C / N ratio of 20-30 nutrient standards desired by microbes to produce methane gas , The residence time (retention time) as the raw material of 10-15 days, temperatures 30-500C growing standard thermophilic bacteria, organic substrates Award Speed (loading rate) 8 kg / m3 / day, 6-7 pH, water content in the ratio 1: 1 (raw materials and water). The technological process can be produced products include: dry matter 18%, 6 kg of bio-gas per day, and dry fertilizers amounted to 8 kg per day. The study also produced per kg of organic materials (residual tananman), 0,8- 2 m3 of bio-gas fuel value bio gas is 500 -800 BTU / ft 3 or 5.7 -7.2 KKL / liter. The findings of this research is the bacteria producing methane gas is dominated by bacteria such as Methanobacterium formicum rod, Methanobecterium Propionicum, Methanobacterium sohngenil, Methanobacterium subboxidans. Bacteria berspora Methanobacillus omelianskil. Bacteria form spherical Methanoccocous Mazel, Methanoccocous vannielii, Methanosarcina barkerii, Methanosarcinamethanica.

Keywords: technological process, microbes, bio Gas

INTRODUCTION

Of several alternative the utilization of energy in surrounding , relatively favorable is the process biogas . Because in the process biogas besides obtained it is also obtained organic fertilizers that can be dimanfaahkan back , in recycling' into the ground .On the following is will discuss about how the operation of biogas in rural areas .In this business absolutely necessary raw materials of waste debris , the rest of animals.Gas bio is the basic substance to be changed into gases in biologi such as the various organic matter , including material the remains (sewage) .Gas that forms composed of partially methane gas .Methane gas own is colorless , tasteless and odorless , smell gas-bio inflicted by other components as: CH4, , CO2 , H2 , N2 , H2S , CO DAN O2 , NH3 .Play an important role in production process biogas this is bacteria .Waste that can be converted into biogas hardly limited .Polymer carbohydrates as: cellulose , or protein and fat can tear down. Perombakannya process through two stages, each carried out by different bacterial groups. The first phase of an overhaul of complex polymers occurred into simple compounds, particularly organic acids. Therefore, the first stage of the bacterial group is referred to as bacterial penghasah acids (' acid producing bacteria '). The second phase is a continuation of the first stage of the reshuffle took place acid-organic acids into bio-gas. Then a group of bacteria that work on the second stage this is a real group called the methane bacteria (' methane producing bacteria ') below is an overhaul of the process. Perombakannya reaction is as follows:

CNOSH … anaërobic bacteria… $RCOOH + CO_2 + H_2S + NH_3 +$ energy + fertilizer
Acid produser

RCOOH……… anaërobic bacteria $CH_4 + CO_2 +$ Energy
Organic Acid methane

The Waste of household , agriculture and industry elaborated by bacteria group mentanogen can produce biogas who most in the form of methane .Biogas (methane) can occur of decomposition waste organic containing proteins , fats and carbohydrates .The formation of biogas lasting through a fermentation process anaerobic or not relating to air free .The process of fermentation is a reaction oxidation-reduction in the biological system that produces energy , where as donors and aseptor its electrons used organic compounds .Fermentation anaerobic can only be achieved by microorganisms that can use molecule other than oxygen as aseptor electrons .Fermentation anaerobic produce biogas consisting of methane (50-70 %) , of carbon dioxide (25-45 %), a little hydrogen , nitrogen and hydrogen sulfide (caldhwel , 2001) . There are three stages in making biogas:

a. the first stage is the reduction of organic compounds that complex into a compound a simpler by bacteria hydrolytic .This bacteria work at a temperature 300-40oc mesophilik group and the temperature between 50°C -- 60°C to termophilik group . The first stage and this goes on with the ph between 6-7 .
b. the second phase is a change in a simple compound being an organic acid which is volatile as acetic acid , butyric acid , acid propianat and others .Since the enactment of an organic acid ph then it will continue to decline , but at the same time formed a buffer that can neutralize pH .Acid form bacteria the organic of them are pseudomonas , flavobacterium , escherichia and aerobactar .
c. the third stage is the conversion of an organic acid to methane , carbon dioxide and gases such as hydrogen sulphide , hydrogen and nitrogen .

organic material $\rightarrow CH_4 + CO_2 + H_2S + H_2 + N_2$

This conversion done by bacteria methane as: methano bacterium omelianskii , M sohngenii , M suboxydans , m propionicum , M formicium , M rimunantium , methanosarcina barkeril , methanococcus vannielli and methanococcus mazei .In the process perombakannya , not all material terombak perfect .Materials like lignin is disturbing reshuffle. .After all of material that can be terombakpun not all terombak total compound .There are still the rest of a compound of organic matter can terombak (digestible matter) .But the rest of this compound has become a simple compound , can be used as fertilizer (caldwell , 2001). Part a compound terombak into gas is compound C (carbon) , who mainly from carbohydrates .Means almost all compound n in waste remain a rest or terubah into cells .So can be used as fertilizer source N . The results of gas obtained is depend on the circumstances and kind of limbah.bahan a basis for the process gas-bio. In principle waste as the fundamental substance of the process biogas divided into three groups of:

A. an agricultural waste / plantations.
An agricultural waste / plantations is easy received and available in a relative amount very much.But there are it untungannya, that an agricultural waste / plantations usually ' rowa', difficult pulverized to be made ' slurry', and in general containing lignin who cannot digested.So if used as a process biogas, have to every time cleanse from digester (, such).So to use an agricultural waste / plantations as the fundamental substance of biogas there are three alternative can be selected :

- chosen materials contain many water, and dipres then fluid digested be biogas.
- select materials tldak containing lignin.

- done reshuffle introduction in aerobic, then processed into gas bio

Lack of other than the utilization of waste farming or plantation ialahpada generally poor will nitrogen, so we needed ditambahsumber n, such as will discussion in the discussion of nutrients.

B. Cow feces. This material of cow many use and suitable for the process biogas..Composisiton N enough live, easily mixed into pulp and allow processed continuously, to the cow corral and perencanaan.di between various dung , manure is the most suitable for be turned into biogas. It is attainable and easily produce gas in large quantities, and the rest is fertilizer very rich nitrogen .

Table 1. Composition Cow feces and Output

Unsure	Cow Waste (%)	Output(%)
Dry material (total solid, TS)	18,2	8,8
Volatile solid, VS	13,99	8,09
Fixed solid, PS	6,23	3,21
Nitrogen total, N	5,1	2,8
Carbon, C	42,0	40,5
Comparative C/N	19,8	27,4

Sources : Laboratory analysis, 2005

C. Human feces .

The material also is good for use in the process biogas , but overall psychological in its operation .So in its implementation should be designed equipment that is easy to work continuous , without too much dipindah-pindahkan openly. One of them is the use of material top stools look at like plastic but will soluble in water after submerged in a very long time , or plastic itself can also digested by are bacterium methane .There are still groups other waste that can be used , waste due to human activities that was not included in a and b. waste households in the form of leftover bits of food, the rest of cooking, papers wrap, etc. And waste processing companies agricultural products .

In principle there are only two equipment biogas , namely a tool digester (, such) and collectors gas instrument .Instrument, such there are various types of , among others a kind of drum , a kind of a tub and the type of tire .Producer gas-bio instrument it is usually distinguished according to the manner of charging feedstocks: -- bulk charging –continu charging. A tool producer gas-bio the precipitation of a kind of charging shown in gamhar 1 (a) .This device consisting of two among the main components of which is this: 1) tank, such; and 2) collection tank gas (see figure 1 (a)) , this type of charging called precipitation because the completion of the raw materials for this device diisikan as well as in the number of the precipitation of ( ) into bulk tank, such; later collection tank gas couched into tangki-pencerna as shown in figure 1 (a). After a certain period of time , stuffing in a tank, such begin to experience of digestion (digestion) and gas-bio he began to produce. It is clear that the type of bulk charging, the process of filling in be done at once and digestion takes place. After all of material have been unused diisikan discharged , this means not produce gas-bio in great numbers again .If the production of gas has been made to cease, then all of the components of an instrument are cleaned, especially that part dalamnnya .So next , the cycle of work an instrument such as detailed above repeated .So tangki-pencerna filled again , collection tank gas couched on top of it and so on .

MATERIAL AND METHODS

Objective, steps of experiments, location and time

Object of this research aims to understand the role of microorganisms in produce gas bio and raw materials fertilizer in technological progress by using system of (do bulk). This research consisting three rounds of experiment.Technological progress of 1) standard treatment biology given 2) a product produced 3).The sample collection done may 2016 and analysis raw materials the results of the process done in the laboratory Udayana University Denpasar Bali, of June 12 to 2 august 2016.

Study on the operational process system of bulk technology

Instrument producer gas-bio kind of charging of consisting of two a major component namely: 1 tank, such; and 2) gas tank collection, with three stage of the proceedings namely decomposition process, fermentation and stabilization.Each phase prose given treatment biology of (figure 1).

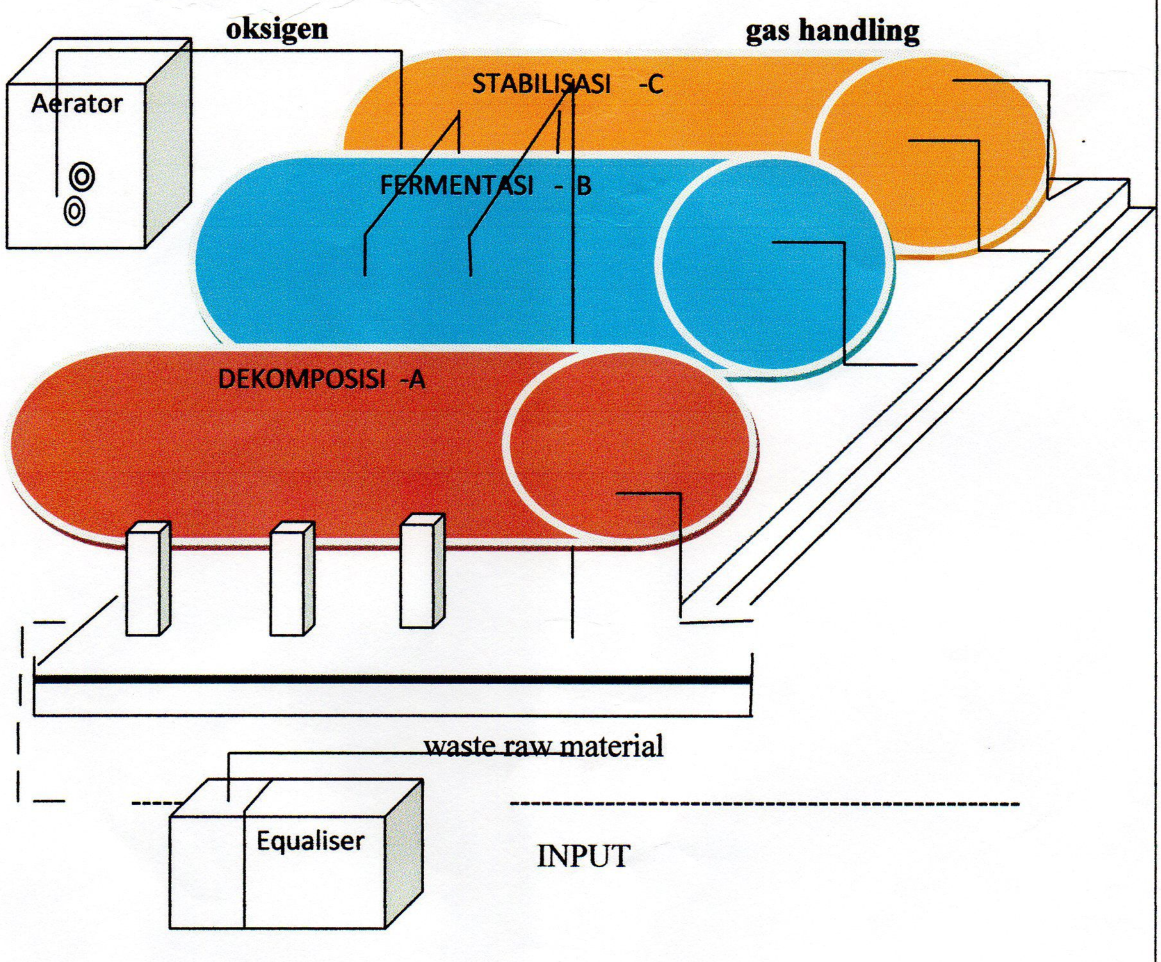


Figure 1 . Design of Bulk Technology System

Treatment biological

In the do bulk technologi step with the process of technologi c / n the ratio of 20-30 the nutrient requirements desired by microbes to produce methane gas .Time live (retention time) raw materials 10-15 days , 30-500°C temperature requirements grow bacteria are thermophilic, the speed of the provision of that of the substrate organic (loading rate 8 kg per Cubic meters per day, pH 6-7, the water level by comparison 1 to 1 (raw materials and water) .

Study on quality and characteristic fertizer matter

Physical qualities , chemical and biological from raw materials biogas of the stage decomposition process, fermentation , and stabilization (in a, b and c) . Raw materials biogas analyzed in stages of decomposition (in a) and fermenting (in b)

Data Collection

Sample taken from each stage of the proceedings (decomposition, fermentation and stabilization and treatment biology .Analysis the quality and characteristic of the results of production process biogas done in the laboratory Udayana University.

Physical and Chemical analysis

The physical (TSS and MLSS) characteristics of matter biogas were analyzed with photometric method using tss portable hand held turbidity lxv322.9900002 system product (gli international hach radiometer analytic) .Sulphide, magnesium, ammonia , ammonium acids, were analyzed tittrimetrically using electrometric and digital titrator, catride 0.080 m , test kit , 500 ml Calcium Magnesium indicator solution , 50 ml ammonia electrode filling solution , 5g hundredths ml phenolpthalene indicator solution , tnt plus .The 8075 total kjeldahl nitrogen , nessler & apos range: 1-150 mg / l , nitrogen ammonia standard solution, mg / l , 500 ml NH3-N was used to analyze n (nitrogen organic) .Nitrates and nitrites were analyzed with spectrophotometric method using 8171 spectrophotometer powder pillows of accuvac range: 0.1-10.0 mg / l NO3-N (hach acc brand). P , K , Ca , The , Fe and mo were analyzed using atomic absorption spectrophotometer (aa30 , variant , usa) .All metals , except calcium were atomized using acetylene and water .Calcium.

Microorganisms and bacteria were calculated using 8091 MPN (Most Probably Number) method Coliform-Total and E-coli Lauryl Trypose w MUG Broth Most Probable Method. Range: MPN Count table, Dri-Bath 12-Well, 120 V (HACH, USA Brand) incubator. All analyses were conducted in the laboratory of the faculty of Mathematics and Natural Resource Science of Gajah Mada University, Yogyakarta (Gajah Mada University Laboratory, 2016).

The production of biogas was calculated using the equation

$$\frac{\text{the installation organic matter capacity } (m^3/\text{day})}{\text{the discharged organic matter } (m^3/\text{hr})} \quad \ldots\ldots\ldots\ldots\ldots\ldots(1)$$

While the production of nutrients was determined from the nutrient microorganisms demand equation

$$\text{BOD:N:P} = 100:5:1 \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(2)$$

RESULTS AND DISCUSSION

The research in an research obtained raw materials of debris and cow dung .The results of the analysis laboratory shows that the raw material used dominated by organic matter containing carbohydrate and protein and fats us indicated by parameter of TSS , ammonia, nitrates, nitrites .

The operational of Bulk technology

The bulk technology in area experiment had met standard operational criteria for biological processing of matter fertilizer organic. The steps of process of bulk technology showed that the technology had met the operational standard, due to focusing on biological principles with the concept of usage and quality of safe, efficient and environmental organic matter. This was prove by the quality of organic matter produced in fermentation level or step (B pond) and in stabilization level (C pond).In addition, the characteristic of the organic matter produced in stabilization level had also met the quality standard for fertilizer material (Hammer, 2001).

Biological treatment

Each stage of the proceedings given treatment biology of c / n the ratio 20 to 30 requirements nutrients command microbes for producing a gas methane .You have (retention time) raw materials 10-15 day , temperature 30-500c requirements growing bacteria are thermophilic , speed the provision of a substrate organic matter (loading rate 8 kg / m3 per day , pH 6-7, the water level by comparison 1: 1 (raw materials and water) .Decomposition process and fermenting in aerobic (need oxygen) or in anaerobic (do not require oxygen) .Any material organic can tear down with both that way , but the end result will different namely resulting gas bio and raw materials fertilizer .The process can accelerated by the provision of a substrate organic matter (loading rate . Ph and alkalinity will affect kind of micro-organime and the role of organisms in the process biologist (Barnum , 2005) .

The role of stem bacterium in process technology for making bio gas

The results of the analysis laboratory shows that samples to be taken on stages of decomposition and fermenting dominated by bacteria the stem like; methane bacterium formicum , methane bacterium propionicum, methane bacterium sohngenil, methane bacterium sub-boxidans.Bacteria sporulated methanobacillus omelianskil .The form of spherical bacteria methanoccocous mazel , methanoccocous vannielii , methanosarcina bacterium , methane sarcinamethanica (figure 2)

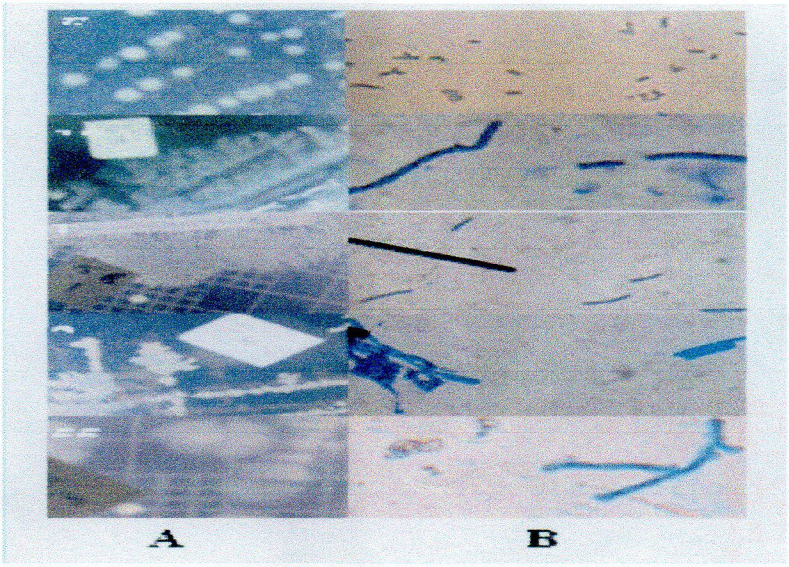


Figure 2. The shape of the cell form bacteria mucus biofilm in makroskopis (a) and microscopic (b).

Production of fertilizer Materials and Gas Bio

The analysis shows composition the average gas-bio CH4, 50-75 % , co2 27-40 % , H2 1-10 % , N 20,5-3 % , H2S -1 % , Co 0.1 % and O2 , NH3 .The calculation on (eg 2) was found that the TSS , the mlss the material fertilizer) fertilizer dry 8 kg per day and gas bio production dry substances 18 % , 6 kg gas bio per day on the calculation on eg 1). The research also produced every kg organic matter (organic matter) , 0,8- 2 m3 gas bio with the natural gas bio are 500 -800 btu / ft 3 or 5.7 -7,2 kkl per liter .

REFERENCEES

Bamum, S. R., 2005. Biotechnology An Introcuction. Edition 2. Miami University. ISBN 0-534-49296-7. USA. p. : 323.

Bence, K.A. Kvenvolden and M.C. Kennicutt, 1996. Organic Geochemestry Applied to Environmental after the Axxon Valder Oil Spill - areview : Organic Geochemistry, 24: 7-42.

Brim, H., Mc Farlan SC, Fredrickson JK, Minton KW, Zhai M, Wackeit LP and Daly MJ. 2000. Engineering Deinococcus Radiodurans for Metal Remediation in Radioactive Mixed Waste Environments, Nature Biotechnology. I8 (l): 85-90.

Caldwell, B. 2001. How can Organik Vegetable Growers Increase Soil Organic Matter without Overloding the Soil with Nutrients. *Small farmer's Journal*. Vol. 25, No 3 : 223 – 23.

Creswell, Jhon W. 2009. *Reseach Design; Qualitative, Quantitative and Mixed Methode Approaches.* Los Angeles; Sage.

Diaz, E. 2008. *Microbial Degradation, Bioremediation and Biotransformation.* ISBN : 978-1-904455-17-2. Disitir date 17 September 2008. 8h.

World bank, 1992. Development and the Environment. World Development Report 1992. Washington D.C.

Schuler, C.; J. Pinky; M. Nasir and Vogtmann. 1993. Effects of composted organic kitchen and garden waste on *Mycosphaerella pinodes* (Berk, et Blox) Vestergr.,causal organism of foot rot on peas *(Pisum sativum* L.), Biological Agriculture and Horticulture, 9: 353-360.

Shapiro, D.I.; G.L Tylka and L.C. Lewis. 1996. Effects of fertilizers on virulence of *Steinernemacarpocasea,* Applied Soil Ecology, 3(1) : 27-34

Diaz, E. 2008. *Microbial Degradation, Bioremediation and Biotransformation.* ISBN : 978-1-904455-17-2. Disitir tanggal 17 September 2008. 8h.

Efendi, H. 2003. The quality of water for the management of marine resources. Yogyakarta: PT Kanisius.

Ekhaise. F.O., and Omavwoya. B.P. 2008. *Influen*ce of Hospital Wastewater Discharged from University of Benin Teaching Hospital (UBTH), Benin City on its Receiving Environment. *American-Eurasian Journal.Agric. & Environ. Sci.;* 4(4): 484-488, ISSN 1818-6769.

Emmanuel, E, Blanchad, JM., Keck,G., Perrodin,Y. 2001. *Effects of Hospital Wasterwater on aquatic Ecosistem XXVIII.* Congerreso Interamecano de Ingeria Sanitaria Ambiental Cancun. Mexico.

Fairchild, G.I., Barry, D.A.J., Goss, M.J., Hamill, A.S., Lafrance,P., Milburn, P.H., Simard, R.R., Zebarth, B.J. 2000. *Groundwater Quality.* In The Health of Our Water Toward Sustainable Agriculture in Canada. Ed. Coote, D.R. and Gregorich, L.J. Research Branch Agriculture and Agri-Food Canada. Publ. 2020/E.

Fardiaz, S. 1993. *Analisis Mikrobiologi Pangan*, Jakarta: PT Raja grapindo Persada.

Giyatmi. 2003. "Efektivitas Pengolahan Limbah Cair Rumah Sakit Dokter Sarjito Yogyakarta terhadap Pencemaran Radioaktif" (*tesis*). Yoyakarta: Pasca Sarjana Universitas Gajah Mada.

Gegner, L. 2002. *Organic Alternatives to Treated Lumber*. NCAT/ATTRA, Fayetteville, AR.

Hammer, M.J. Jr. 2001 *Water and Wastewater Technology*. Prentice-Hall: New Jersey.

Harker, D.B., Chambers, P.A., Crowe, A.S., Fairchild, G.L., and Kienholz, E. 2000. Understanding Water Quality. *In The health of Our Water Toward Sustainable Agricultur and Agri-Food Canada*. Publ. 2020/E.

Hendricky, C., Lambert, R., Sauvenier, X., and Peeters, A. 2005. Sustainable Nitrogen Management in Agriculture : An Action Programe towards Protecting Water Resources in Alwoon Religon (Belgium). *Paper presented on OECD Workshop on Agriculture and Water.* Sustainability, Markets and Policies: Australia.

Heider J. And Rabus, R. 2008. Genomic Insights in The Anerabic Biodegradation of Organic Pollutans. *Microbial Degradaton*; Genomic and Molecular Biologuy: Caister Academic Press.

Kasmidjo. 1991. Handling waste plantation and food waste . Yogyakarta: Universitas Gajah mada.

Kusnoputranto, H. 1997. Limbah cair*dan Ekstrata Manusia,* Jakarta: Direktorat Pembinaan Penelitian dan Pengabdian Masyarakat.

Kumar, G.A., Kumar, S., Sabumon P.C. 2006. Preminary Study of Physico-Chemical *treatment* Options for Hospital Wastewater. *Journal of Environmental Management;* Vollore Tamil Nadu: India.

Kienholz,. E. F. Croteau, G.L. Fairchild, G.K. Guzzwell, D.I. Masse, and T.W. van der Gulik. 2000. Water Use. In The health of Our Water Toward Sustainable Agriculture in Canada. *Research Branch Agriculture and Agri-Food Canada*: Publ. 2020/E.

Lovley, D.R. 2003. Cleaning up with Genomic, Applying Molecular Biology to Bioremediation. *Nature Reviews*; Microbiology.

Lestari, D.E., Utomo, S.B., Sunarko, Virkyanov. 2008. "Pengaruh Penambahan Biosida Pengoksidasi Terhadap Kandungan Klorin untuk Pengendalian Pertumbuhan Mikroorganisme pada Air Pendingin Sekunder RSG-Gas" (*tesis*). Pusat Reaktor Serba Guna-BATAN. Kawasan Puspitek Serpon. Tanggerang. Banten.

Martin, F.R.J., Bootsma,A., Coote,D.R., Fairley, B.G., Gregorich,L.J., Lebedin,J., Milburn, P.H., Stewart, B.J., and T.W. Van Der Gulik, T.W. 2000. Canada,s Rural Water Recources. In The healt of Our Water Toward Sustainable Agricuture in Canada Ed. Coote, D.R. and Gregorich, L.J. *Research Branch Agriculture and Agri-Food Canada*; Publ. 2020/E.

Mesdaghinia. A.R., Naddafi, K, Nabizadeh, R. Saeedi R, Zamanzadeh. M. 2009. Wastewater Characteristics and Appropriate Method for Wastewater Management in the Hospitals. *Iranian Journal Publ Health;* Vol.38, No.1: 34-40.

Mikkelsen, R. I. 2000. Nutrien Management for Organic Farming Case Study. *Journal of natural Recource Life science Education;* Vol 20: 88-92.

Mulvaney, R. I., Khan, S.A., R. G., Hoef, and Brown, H. M. 2001. A Soil Organic Nitrogen Fraction that Reduce the Need for Nitrogen Fertilisastion. *Soil Science Society of amerika journal*; Vol 65: 1164-1172.

Meagler, R.B. 2000. *Phytoeremediation to Toxi Elemental and Organic Pollutants.* Current Opinion In Plant Biology 3 (2) : 153-162.

McLeod M.P., and Eltis L.D. 2008. *Genomic Insights Into the Aerobic Pathways for Degradation of Organic Pollutants, Microbial Biodegradation*: Genomic and Molecular Biology. Caister Academic Press.

Purwoko, T. 2007. Physiology microbes . Jakarta: PT Bumi Aksara Jakarta.

Pusstan, 2003. *Dasar-Dasar Teknologi Pengolahan Limbah Cair.* Available from: URL.http://dphut go id/informasi/setjen/piusstan/info 5 1 0604/isi 5 htm (disitir 8 september 2008).

Pang X.P. and and letey J 2000. Organik farming : Challenge of timing nitrogen Avaibilityto crop nitrogen requirement. *Soil Society of Amerika Journa;* Vol. 64: P.247-253.

Rao, S., dan Mamatha, P. 2004. Water Quality in Suistanable Water Management. *Current Science;* Vol 87 (7): 942-947.

Rukaesih, A. 2004. *Environment Chemical*. Yogyakarta: Publisher Andi .

Sarafraz, S., Khani, H., Yaghmaeian,M.R. 2007. Quality and Quantity Survey of Hospital Wastewater in Hormozgan Provinze. *Iran Journal. Environ. Health. Sci. Eng.;* Vol 4,No.1: 43-50.

Simmons,R.W., Noble,A.D., Pongsakul, P., Sukreeyapongse, O. and chinabut, N. (2009)"Cadmium – hazard mapping using a general linear regression model (Irr-Cad) for rapid risk assessment". *Environmental Geochemistry and Health,* vol 31,pp71-9.

Saeni. 1989. Environment *Chemical.* Bogor: Ditjen Pendidikan tinggi Institut Pertanian Bogor.

Schuler, C, J., Pinky, M. Nasir and Vogtman, 1993. Effects of fertilizers on Mycosphaerella pinodes (Berk, et blox) Vestergr., causal organism of foot rot on peas (Pisum sativum L.), *Journal Biological Agriculture and Horticulture, 9: 353-360.*