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UTILIZATION OF HYACINTH BIOGAS (EICHORNIA CROSSIPES) AND GOAT DUNG (FAECES) AS ALTERNATIVE ENERGY SOURCES

Surachman[1], Hari Irawan[2], Ryan[3]
[1,2,3]Universitas Bina Bangsa
Email: rachmanbjr@gmail.com*

ABSTRACT

Research has been conducted on using hyacinth biogas (Eichornia crossipes) and goat dung (faeces) as alternative energy sources. This research aims to design reactors, measure temperature, measure pH, conduct flame tests. This study shows that the temperature, pH, and composition of material comparison greatly influence the formation of biogas. The ratio of hyacinth mass and water used is 1.1, 1:2, and 1:3 with each ratio given goat dung as much as 400 grams. All treatments produce a gas that can ignite. Heat produced is between 12.75 calories to 16.6 calories.
Keywords: *hyacinth;biogas;reactor*

INTRODUCTION

After the fuel price rose some time ago, people's lives in villages and cities are increasingly complex. Residents are vying for alternative energy sources, some using solar energy, water energy and wind energy. However, so far there is still no source of energy that can replace fuel oil. There is a relatively simple alternative energy source and is perfect for rural communities. The alternative energy is biogas. Millions of cubic meters of methane in the form of swamp gas or biogas produced annually by decomposition of organic matter, both animal and vegetable are almost the same amount as natural gas pumped out of the ground by oil companies and used by us for lighting, cooking, industry and others. In the past, biogas has been treated as a harmful product, which should be disposed of as quickly as possible, instead of being utilized for practical purposes. Today some people have started to see biogas as a new energy source that can be utilized and managed safely. This biogas forming material can be livestock manure, human waste, household waste, agricultural waste, etc. One of them is hyacinth known as water weed.

Biogas has a high energy content that is not inferior to the energy content of fossil fuels. The caloric value of 1m3 biogas is equivalent to 0.6-0.8 liters of kerosene. To produce 1kwh of electricity it takes 0.62-1 m3 of biogas, equivalent to 0.52 liters of diesel oil. Therefore, biogas is very suitable to replace kerosene, LPG, and other fossil fuels. Biogas contains 55-75% methane. The higher the methane content in the fuel, the greater the calories produced. Therefore, biogas also has the same characteristics as natural gas. Thus, if biogas is processed correctly, it can be used to replace natural gas.

Adoption of technology can convert water weeds in this case hyacinth into energy in the form of biogas. Biological conversion in the form of biogas includes high

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efficiency technology because biogas process residues can also be utilized as high-quality products. Without the involvement of waste treatment technology, methane from natural waste decomposition will escape and pollute the atmosphere without benefit. From that point of view, it can be concluded that biogas technology includes environmentally friendly technology. Based on the above, we group of 48 daffodil villages cikande district of Serang regency research the use of hyacinth and goat dung as an alternative energy source.

Hyacinth *(Eichornia crossipes)* is a water plant that grows in swamps, lakes, reservoirs and rivers whose flow is calm. One type of floating water plant. Besides being known by the name of hyacinth, in some areas in Indonesia, hyacinth has another name such as in the Palembang area known as Kelipuk, in Lampung known as Ringgak, in Dayak known as Ilung-ilung, in Manado known as Tumpe. Along with the development of science and technology, the hyacinth plant part after being dried can be used as a raw material for making beautiful women's bags, suitcases, sendals, baskets (places of used clothing), glass trays, mats, trays and so on. Lately it is widely used to support the furniture and furniture industry, as a substitute for rattan whose price is increasingly slim. However, as the scarcity of fuel, the presence of hyacinths is also glimpsed. If we only know biogas from goat dung all this time, then now hyacinth can also be used as biogas.

Hyacinth contains *lignocellulose,*while *cellulose* is a material for paper making, in addition, with its cellulose content, hyacinth can also be used as a *bioethanol* manufacturing material that is now needed to overcome the reduced world oil production.

The chemical composition of enceng goiter depends on the nutrient content in which it grows, and the absorption properties of the plant. Enceng goiter has good properties, among others, it can absorb heavy metals, sulfide compounds, contain more than 11.5% protein, and contains cellulose that is higher than non-cellulose such as lignin, ash, fat, and other substances. In the table, Anonymous (1966) in his research on enceng goiter from Banjarmasin revealed the chemical content of fresh old hyacinth stalks.

Table 1
Chemical Content of Fresh Hyacinth

Chemical compound	Percentage (%)
Water	92,6
Ash	0,44
Coarse fiber	2,09
Carbohydrates	0,17
Fat	0,35
Protein	0,16
Phosphorus as P2O5	0,52
Potassium as K2O	0,42
Chloride	0,26
Alkanoid	2,22

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Meanwhile, R. Roechyati (1983) presented the content of the stalk of dry hyacinth furnace in table II.

Table 2. Chemical Content of Dried Hyacinth

Chemical compound	Percentage (%)
Cellulose	64,51
Pentosa	15,61
Lignin	7,69
Silica	5,56
Ash	12

Figure 1: Hyacinth

Goat Dung (Faeces)

Goat dung contains organic matter that can provide nutrients for the process of biogas candy. Goat faeces contain little water so they are easily decomposed.
The results of the study Hikmah (2008) goat dung contain:

Table 3 Chemical content of goat manure

Chemical compound	Percentage (%)
Sodium	1,19%
Phosphorus as P2O5	0,92%
Potassium as K2O	1,58%

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Figure 2: Goat Dung Collection

Biogas

Biogas is a gas produced by anaeorobic or fermentation activities from organic materials including human and animal waste, domestic waste (household) biodegradable waste. The main contents in biogas are methane and carbon dioxide. Biogas utilizes the digestive process produced by methanogen bacteria whose products are methane gas.

Scientifically biogas produced from organic waste is a flammable gas, this gas is produced from the fermentation process of organic materials by anaerobic bacteria (bacteria that live in airless conditions). Generally, all types of organic matter can be processed to produce biogas, but only homogeneous organic materials, both solid and liquid are suitable for simple biogas systems. When these organic wastes decay, methane gas (CH4) and carbon dioxide (CO2) are produced. However, only CH4 is used as fuel. Generally, the methane content in organic waste reactors varies. In his research, Zhang et al (1997) produce methane by 50-80% and carbon dioxide by 20-50%. Hansen (2001) in his biogas reactor contains about 60-70% methane, 30-40% carbon dioxide, and other gases including ammonia, hydrogen sulfide, and other gases. However, in general the range of biogas composition is as follows:

Table 4. Composition of Biogas

Chemical compound	Percentage (%)
Methane (CH4)	55-75
Carbon dioxide (CO2)	25-45
Nitrogen (N2)	0-0,3
Hydrogen (H2O)	1-5
Hydrogen sulfide (H2S)	0-3
Oxygen (O2)	0,1-0,5

METHOD

Location of material collection

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a. Hyacinth hyacinth part of the research taken from the swamp in the village of Daffodils cikande subdistrict
b. Goat manure is taken from goat farmers in the village of Cikande Subseiling

Location of The Slaughter

The research was conducted at Posko Group 48 Village daffodils Cikande – Serang

Tools and Materials

a. Tool
   These research tools include: drums, hoses, hose clamps, Degister measuring instruments.
b. Material
   The materials used are hyacinth, water and feces (Faeces) goats as a starter compared to (1:2)

Work process

a. Manufacture of Reactors
   Cleaning Plastic Drums

Preparation of Biogas materials

a. Take a hyacinth and smooth it
b. Weighing hyacinth
c. Weighing water and weighing goat dung
d. Put hyacinth, water and goat dung into the reactor tube, then close tightly and wait for the candy results for 14 days and the digester filled (expand) results have been tried.

Test The Flame

a. Open faucets
b. Lighting a fire on a faucet while pressing on a gas reservoir

RESULTS

1. Reactor Design

The design results of the simple biogas reactor that has been created can be seen in Figure 3

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Figure 3. Reactor Design

2. The process of gas formation

Before being put into the reactor, hyacinths must be cut into small pieces first. This aims to make the decay process faster so that the process of decomposing hyacinths can be faster. After that, this hyacinth is inserted into the reactor, added with a starter in the form of goat dung and water with a specific ratio, then stirred to mix evenly and the reactor is closed tightly. This is so that the decay process can occur evenly.

After a few days the reservoir began to fill with gas. That is a sign that the fermentation process that produces gas has been running, and the more days the gas produced the more. The material will be pushed upwards due to more significant gas pressure at the bottom therefore the reactor must be shaken to hyacinth. Goat dung and water can be remixed. It aims to keep uniformizing the composition and temperature in the reactor. Uniformization of the temperature in the reactor is very important so that the growth of bacteria can be more even and fast. The faster anaerobic bacteria develop will cause methane gas production also faster.

Table 5: Gas Formation Time

No.	Composition	The day of gas formation								
		1	2	3	4	5	6	7	8	9
1	1:1									√
2	1:2							√		
3	1:3				√					

In this study the reactor was allowed for up to 34 days. The result in composition 1, the balloon cannot be filled until the 20th day, on composition 2, the balloon is filled on the 13rd day, while in composition 3, the balloon is filled on the 9th day. in composition 3, (1:3) the gas is formed continuously from day 4 to day 18 then stops producing with the optimum time of gas formation on day 8 to day 12. In composition 2, (1:2) the gas is formed continuously from day 7 to day 25 then stops with the optimum time of gas formation on the 11th to the 16th day. In composition 1, (1:1) the gas is formed on the 9th to the 17th day then stops until the 25th day after the 25th day the gas is re-formed and the gas is produced more and faster than during the period of day 9 to day 17, with the optimum time of gas formation on the 26th to the 28th day. This indicates that the more water composition, the faster the optimum time of gas formation, and the less the water composition, the slower the optimum time of gas formation. The formation of this gas is detected by the development of inner tires that indicate that the gas has been formed and the volume of the inner tire increases.

3. Test Flame

The flame test is performed starting on the 2nd day, and the results of this flame test can be seen in Table 6

Table 6: Test on

No.	Composition	Test Day												
		2	3	4	5	6	7	8	9	10	11	12	13	14
1	1:1	-	-	-	-	-	-	-	-	-	-	√	√	√
2	1:2	-	-	-	-	-	-	√	√	√	√	√	√	√
3	1:3	-	-	-	-	√	√	√	√	√	√	√	√	√

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In Table 6 it appears that all compositions can light up. At the time of the flame test, it looks blue fire which means the methane gas content is quite good. The flame test is done by opening the faucet and then burning the gas using a match. This treatment is not dangerous because the gas pressure in the reactor is not so significant, so it does not cause explosions or pose a danger. The greater the pressure in the reactor, the greater the fire formed or visible. In composition 1 gas can burn on the 12th day. In the composition of 2 gases can burn on the 9th day. In the composition of 3 gases can burn on the 6th day. This gas can burn a few days after the formation of the gas is detected. This is because the content of 33 gases still contains a lot of CO2s, and the amount of gas is still minimal. Biogas hyacinth that is removed please have a slight smell but after burning the gas does not cause odor. This means this hyacinth biogas and goat dung is safe to use.

CONCLUSION

It has been designed a simple biogas reactor and uses materials in the form of hyacinth and goat dung can produce gas that can be used properly. These biogas-forming bacteria can live and thrive at 28oC-31oC, in addition to the fire produced by hyacinth biogas and blue goat dung, and quite well.

REFERENCES

Anomane. 2009. Eceng Gondok. http://www.id.wikipedia.org/wiki/eceng-gondok. diakses 15 Agustus 2021

Azizah Dwi Sadiyah 2011. Pemanfaatan Biogas Eceng Gondok Sumber Energi Alternatif. Makasar

Dani saputra. 2005. Teknologi Biogasteknik kimia ITB , Bandung

Nutjahya,Eddy,dkk. 2003. Pemanfaatan Limbah Ternak Ruminase Untuk Mengurangi Pencemaran Lingkungan. Jakarta

Wahyuni,Sri. 2009. BIOGAS. Penebar Swadaya. Jakarta