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EVALUATION OF BIOGAS PRODUCTION FROM FISHWASTE WITH THREE OTHER CO-DIGESTERS

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Abstract - *In modern world, deployment of energy supply is the major problem so need for biogas is essential. Biogas is eco friendly and best alternatives for fossil fuels. In coastal region fish waste is the major source for biogas production. The efficiency of the gas can be increased by adding co digester materials like baggase, paper waste, dry leaves and cow dung is used as a co substrate. This paper helps to evaluate the enhancement of biogas production by fish waste and co digestion of various feedstsock in different proportions and the efficiency is to be calculated under ambient temperature for 15 days.*

Key Words: *co digester, baggase, feedstock's, paper waste*

1. INTRODUCTION

In present situations the consumption of energy is much important. The fossil fuels are the primary energy sources. Due to the over usage of fossil fuels for cooking, electricity and transportation led to climatic change, global warming and health problems. The fossil fuels are formed by anaerobic decomposition of decomposable waste matters and buried dead organism. It takes more than 500 million year ago, but currently the natural and coals are lasts only for 50 years. The availability of energy can be decreased day by day. So we need to find the alternative for the fossil fuels by using some disuse materials. Biogas is the alternative one. There are various types of feedstock for the production of biogas includes paper waste, baggase, spend tea waste, food waste, bamboo pulp, dry leaves, green leaves, fish waste and animal excreta

The unutilized fish waste create nuisance like bad odour and leachate causes the water bodies polluted. The fish waste also emits some noxious gases such as carbon dioxide, sulfurdioxide, ammonia, methane, hydrogen sulphide and cyanide.

By avoiding the negative impacts while getting added value to the waste. So the fish waste can be processed into some valuable products like biogas. The main advantage of this process is that the product can be used as a fuel for cooking, vehicle and for cogeneration of electricity and heat, and it also reduces greenhouse gas emissions.

2. SCOPE OF THE STUDY

To evaluate the efficiency of the biogas generation and find out the maximum biogas yield, it can be calculated by adding co digester materials like baggase, paper waste, dry leaves and cow dung is used as a co substrate

3. MATERIALS AND METHODS

Materials used in the experiments are fish waste, cow dung, baggase, paper waste, dry leaves.

3.1 Fish waste

The fish waste was collected from the coastal region of Nagapattinam. It consists of offal's and gills. It is obtained that average fish waste in our region is about 2 tons. So it can be processed for the production of biogas

3.2 Cow dung

Cow dung was collected from the local area near Nagapattinam. It refers to the undigested residue of consumed food material being excreted by herbivorous bovine animal species. These species include domestic cattle, bison, yak, and water buffalo.

3.3 Baggase

Baggase is obtained from sugar factory near Kumbakonam. Sugarcane residue is the fibrous material it can be remain after the sugarcane juice. It is used for the production of biogas and it used in the Manufacture of pulp and binding materials.

3.4 Paper waste

Paper waste was collected from the printing press of our institution. When it is blended with cow dung it increasingly generates the biogas production.

3.5 Dry leaves

It consists of grass chippings, sea weeds, wheat straw and mixed grasses. It is obtained from the college campus. The gas yield depends on the amount of cellulose content of leaves. Dry leaves has high cellulose content

4. MEASUREMENT OF BIOGAS BY WATER DISPLACEMENT METHOD

The anaerobic digestion of fish waste with co digestion of some disuse material was tested in 20L plastic digesters with different working volumes. Three laboratory scale digesters were made for the gas production. Leakage in the pipes can be prevented through necessary valves and fittings. The digesters were set up with displacement tank and water collector. Digester contains fish waste and co digester mixture of baggase, paper waste, dry leaves and co substrate of cow dung are added in equal proportion.

Days	Total Gas yield (Ml/kg)		
	Baggase(5kg)	Paper waste(5kg)	Dry leaves(5kg)
5	80	122	100
7	102	135	108
9	122	169	129
11	129	176	137
13	133	188	152

Cow dung is used as a substrate because it increases the growth of the physiochemical properties of the waste and encourages the growth of the microbes responsible for the biogas production The plastic pipe was used to connect the digester and displacement tank called gas outlet. Displacement tank was filled with water. When the gas started coming to the gas collector it displace the water out of the collector.

5. EXPERIMENTAL SETUP AND OBSERVATION

Three containers were filled with 5kg of fish waste. In first container, co substrate - 5kg of cow dung and co digester - 5kg of baggase were added to the fish waste in equal proportion. In second container, co substrate - 5kg of cow dung and co digester - 5kg of paper waste were added to the fish waste in equal proportion. In third container, co substrate - 5kg of cow dung and co digester - 5kg of dry leaves were added to the fish waste in equal proportion.

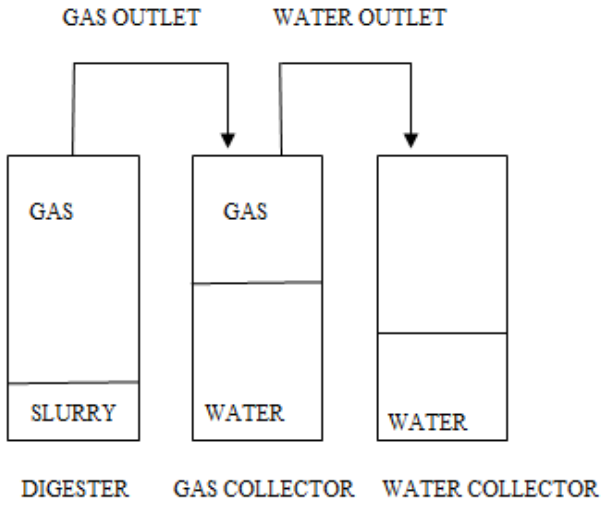


Fig 1: schematic diagram of the experimental set up for water displacement method

The displaced water is measured from the water collector and the gaseous yield was measured by measuring the displaced water volume

6. RESULTS AND OBSERVATION

TABLE I The displaced amount of water in water collector and is measured in (Ml)

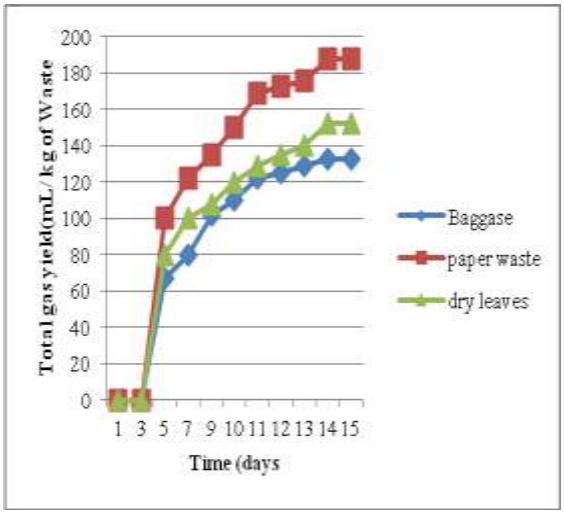
Days	5	7	9	11	13
Baggase	1200	1525	1823	1928	1998
Paper waste	1828	2020	2528	2634	2820
Dry leaves	1520	1620	1935	2050	2280

TABLE II The total gas yield (Ml/kg)

Three containers was filled with 5kg of Fish waste + 5kg of cow dung + 5kg of three other co digesters and the total gas yield was calculated based on the periodic time interval.

The total gas yield for different mixtures of co digester is to be noted. From that, the paper waste shows the maximum biogas production of 188ml/kg. For all the co digestion process the gas generation started on 5th day and the maximum gas yield lies between 10th to 13th day. The biogas generation continued only for 2 days. After that gas generation goes on decreasing

GRAPH I TIME (DAYS) Vs TOTAL GAS YIELD (Ml/Kg)



Among the three, fish waste with paper waste can produce maximum yield. The highest gas production was observed on 13th day as 188ml/kg.

Again five experiments are to be conducted to find the efficiency of gas production and maximum gas yield from paper waste and cow dung with different mix proportion.

TABLE III CO DIGESTER MIXTURE PROPOTIONING IN (Ml)

SI.no	Fish waste quantity(kg)	(Paper waste + cow dung)quantity(kg)	Gas yield (Ml/kg)
1	5	5+5	188
2	5	8+2	286
3	5	2+8	153
4	5	0+10	216
5	5	10+0	201

The efficiency of the biogas gas is much increased in the combination of fish waste and co digester of paper waste in the proportion of 8kg and 2kg. The maximum yield obtained is 286(Ml/kg)

7. CONCLUSIONS

Biogas was produced from the fish waste with three other co digester mixtures such as baggase, paper waste, and dry leaves. Among the three, paper waste can produce maximum yield of 286Ml/kg and the highest gas production was found in the proportion of 8kg of paper waste and 2kg of cow dung.The biogas yield was higher in paper waste that is blended with the fish waste and co substrate as cow dung

REFERENCES

[1] Courtney, B., Dorman, D. (2003) World Wide Fossil Fuels. Chemistry Department of Louisiana State University, July 11, 2003

[2] Milono, P., Lindajati, T. and Aman, S., 1981, Biogas Production from Agricultural Organic Residues". The First ASEAN Seminar-Workshop on Biogas Technology, Working Group on Food Waste Materials, pp. 52-65.

[3] K.M .Akkoli;B M Dodamani, J Jagadeesh A, Ravi C, "Design and construction of food waste biogas plant for hostel mess,"IJSRD-International journal for scientific research and development vol.3,issue 03,2015

[4] Richard Arthur A, Martina Francisca Baidoo A, Edward Antwi B; Biogas as a potential renewable energy source: A Ghanaian case study; Renewable Energy 36 (2011) 1510-1516.

[5] Mata-Alvarez, J., Mac S. and Llabrs P., 2000, "Anaerobic Digestion of Organic Wastes. An Overview of Research Achievements and Perspectives", Bioresource Technology, 74, pp. 3-16.

[6] Sakamma T, Ramesh radder, Maruti H H , Vishwanth G V, and Dr shivakumar B, 2018. Generation of biogas using food waste.