Comparison of Biogas Yeild from Anaerobic Digestion of Rabit Waste and Swine Dung

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Abstract—*The research on anaerobic digestion has increased over the years due to the important of biogas in many homes and industries in the world. Renewable energy such as biogas has contributed immensely to meeting the energy need of many people across the globe. This work compared the quantity of biogas yield from anaerobic digestion of rabbit waste and swine dung. The same volume of digester was used in this experiment to accurately compare the volume of the biogas yield. The maximum volume of biogas produced from the 45 litres digester used was 8.2 litres and 6.8 litres respectively for swine dung and rabbit waste. The maximum atmospheric temperature recorded during the experiment was 31°C.*

Keywords—Renewable Energy, Biogas, Anaerobic Digestion, Atmospheric Temperature, Digester.

I. INTRODUCTION

In recent years anaerobic technology has been well established and satisfied performance in organic waste stabilization [1]. Anaerobic digestion offers an effective way to manage manure by addressing the principal problem of odor control while offering an opportunity to create energy from conversion of biogas with a system of combined heat and power (CHP) [2].

Across the globe, anaerobic digestion (AD) of farm waste has been practiced for many years, as it provides a way to treat raw, organic waste material, improves nutrient recovery and generated a renewable energy source known as biogas [3]. As energy costs rise due to increased demand and uncertainty of supply, environmental regulations grow stricter and farm size has grown larger, farmers are looking to AD and the use of biogas to assist with these issues[4]. A major federal regulation that farmers must adhere to is the Clean Water Act (National Agricultural Compliance Assistance Center, Summary of the Clean Water Act, EPA, 2005)**,** which requires farmers to develop nutrient management plans to reduce non-point source pollution of ground and surface water[5]. There are several hurdles to implementing systems that utilize biogas [6]. These include the high capital, operational and maintenance costs associated with such systems, as well as economic means for biogas production and utilization [7]. In addition, the general public's limited knowledge regarding the potential of agricultural biogas as a renewable energy resource has caused little attention to be paid to the subject outside specialized academic, commercial and government circles. This combination of factors, ranging from economic to educational, has led to biogas being an underutilized resource in the United States and much of the world.

Agricultural biogas consists mainly of methane (CH_4) and carbon dioxide (CO_2) with smaller amounts of water vapour and nitrogen (N_2) and trace amounts of impurities such as hydrogen sulphide (H_2S) and ammonia (NH_3)[8]. The intended use of the biogas dictates the degree to which the gas must be processed before being used. Certain applications, such as using the gas in a boiler or to run an internal combustion (IC) engine require minimal gas processing, while other applications, including using the gas to power a fuel cell or upgrading the biogas to natural gas quality, requires Stringent processing.

II. MATERIALS AND METHODS

Collection of feedstock.

The feedstock used was collected from Animal Science Department at University of Nigeria, Nsukka. The Inoculum was also collected from Crop Science Department University of Nigeria, Nsukka. The Inoculum was combination of rabbit and swine waste that was charged into a digester for some days to accumulate much of the anaerobic bacteria that will stimulate anaerobic digestion.

Experimental Method.

The experiment was conducted at Agric Department, University of Nigeria, Nsukka. Two biogas digesters of 45 litres volume were charged with rabbit and swine dung respectively. The ratio of each waste to water to Inoculum is 2:3:1. The mixture of the dung, water and Inoculum were charged into the digester and allowed for anaerobic digestion. The volume of biogas yield and atmospheric temperature were measured daily.

III. RESULT AND DISCUSION

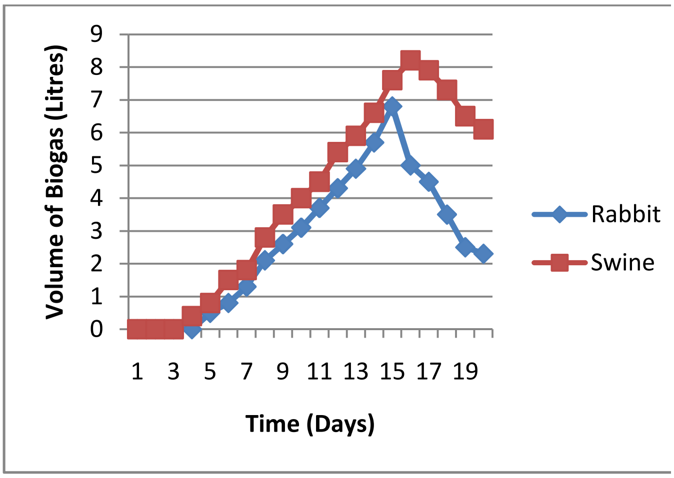

Fig. 1: A graph of Biogas yield (Litres) versus Time (Days)

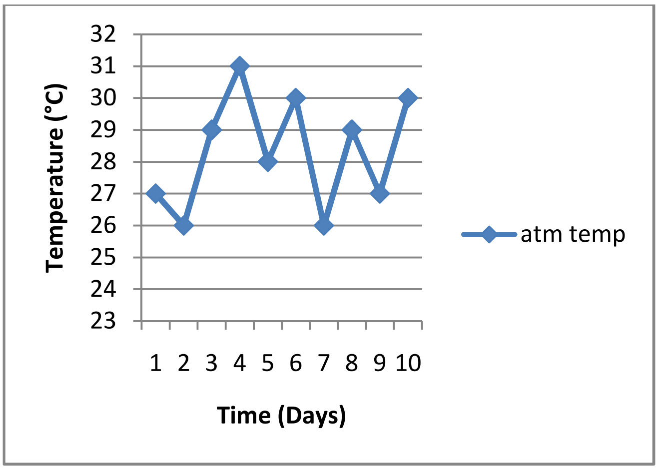

Fig. 2: A graph of atmospheric temperature (°C) versus Time (Days).

The volume of biogas produced in the experiment increased gradually then started decreasing at a point. That shows that anaerobic digestion is a gradual process involving degradation of organic matter by anaerobic organism. The fig 1 above indicated that there was no biogas yield at the first three days in both digesters. That was because of inadequate anaerobic bacteria present for hydrolysis. The lingnocelluse content of the substrates are not properly degraded. The atmospheric temperature measured was not steady indicating that solar radiation varied during the experiment. The more the solar intensity the more the biogas production. The biogas yield of swine dung was greater than the yield in rabbit waste. The maximum biogas yield of the swine dung was 8.2 litres while the maximum biogas yield of the rabbit waste was 6.8 litres.

IV. CONCLUSION

The need to increase energy production is on the increase over the years. The renewable energy usage is increasing gradually due to negative effect associated with the use of non renewable energy. This studied investigated different biogas volume obtained during anaerobic digestion of rabbit waste and swine dung. It was observed that the maximum biogas volume was recorded in the digester with swine dung.

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