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# Analysis of Biomethanation Process from market waste to generate bio energy

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# Analysis of Biomethanation Processfrom market waste to generate bio energy

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**Abstract.** In this study was to incur that the biogas production from traditional market wastes which were represented by cabbage stem and carrot peeling, white mustard were under taken in a laboratory experiment. To produce biogas, the raw material such as cabbage stem and carrot peeling, white mustard and carrot peeling were mixed until C/N ratio close 30:1. Inoculums starter cow dung is put into digester then water is added until 500 liters. The initial pH is measured at throughout the experiments. The anaerobic digestion process is conducted at temperature of 30ºC and the volumes, pH of the biogas yield were observed daily. Biogas yield and cumulative biogas, total solids were analyzed 35 days. The cumulative biogas yield at the 32$^{th}$ day of digestion for cabbage stem and carrot peeling (exp1), white mustard and carrot peeling (exp2) were 2140 liters and 2421 liters respectively. The highest daily biogas yield is achieved on the 22$^{st}$ day of digestion which is found 123 liters and 141 liters respectively. In the first 10 days, the pH level is observed decrease and increase after the day of 21. Although at the end of digestion period the pH will fall down.

## 1. Introduction

An anaerobic of cow dung and solid waste for treatment and generation of biogas yield can be used as bio energy. Generally this process is commonly used in bio digester. In this research the floating dome type digester is used. The large amount of market waste has solid organic waste, 70 % of which are vegetables and fruits. Although, these waste are high water content, low C/N ratio and acid level. On the other hand, the vegetable waste produces bio energy by arranging the C/N ratio. Biogas yield and sustainable environmental source if bio energy is the result of a complex biological process that requires the inclusion of a different type of microorganisms in presence and absence of air. In the other words, biogas yield is frequently produced by the anaerobic digestion or co-fermentation of organic material intimated by [1]. Vegetable wastes organic material having the high calorific value and nutritive value to the microbes, that's why efficiency of $CH_4$ generation can be enhanced by several orders of magnitude. It means higher efficiency and size of digester and cost of biogas yield is decreased and also, in most of the cites and town, vegetable waste is disposed in landfill for discarded which causes the public health hazards and diseases like malaria, cholera, typhoid. It emits unpleasant Odours & $CH_4$ which is a major greenhouse gas contributing to global warming reported Bouallagui [2]. Deressa intimated [3] the biogas production is a favorable dual – purpose technology at present, the biogas production can be used to meet energy requirements while organic waste is a useful fertilizer.

Biogas is a type of bio energy that can be generate from decomposition of organic materials and its mainly composed of methane, carbon dioxide and traces of some other gases. An interesting option for enhancing biogas yields of anaerobic digestion of vegetable wastes are co-digestion, which employs a co-substrate that has the benefit of enhancing the biogas yield due to positive synergism established in the digestion medium and the supply of missing nutrients for microorganisms suggested by Lin [4]. Vivekanandan [5] is reported that the lignocelluloses is one of the plant biomass,

It is primarily consists of three major elements such as cellulose, hemicelluloses and lignin. The other constituents such as water and proteins do not participate in organizing the structure of the organic waste materials. Generally the methanogenic bacteria and microorganisms growth is mainly depends on different parameters like pH, Carbon/Nitrogen ratio, temperature, digester design, inoculum of the digester and hydro retention time.Now a days ananerobic digestion of organic waste and sludge waste are using merging of heating process leading to lower percentage and higher for organic sludge waste to biogas yield in end of the digestion by sathish [6]. It is one of the complex process with a number of synergistic controlled factors, at various vegitable mixed waste, even a small development in the process, gives greater biogas yields which may be better for commerical one [7]. Therefore, the aim of this study is to generate biogas from tradational market waste. The experiments conducted one cubic meter digester.

## Experimental setup

### *2.1 Inoculum*

Initially the digester feed with cowdung in the ratio of 10 % for improve the microorganisms if the floating drum anaerobic digester. It is also enhance the methane yield in the digestion periods.

### *2.2 Materials and Methods*

The figure 1shows the schematic cross sectionals view of the floating drum anaerobic digester. Biomass is chosen for these analyses are experiment 1is cabbage steam and carrot peeling; experiment 2 is white mustard and carrot peeling. These vegetable wastes from market are causes ecological and economic problem in the country. It is collected from the traditional market from Chidambaram town. This study is carried out between 1 to 35 days. Experiment 1, added 40 % of cabbage stem and 60 % of carrot peeling mixed with the same ratio of water added in the digester. Then Experiment 2, 40 % of white mustard and 60 % of carrot peeling mixed with same ratio of water feeded in the digester.

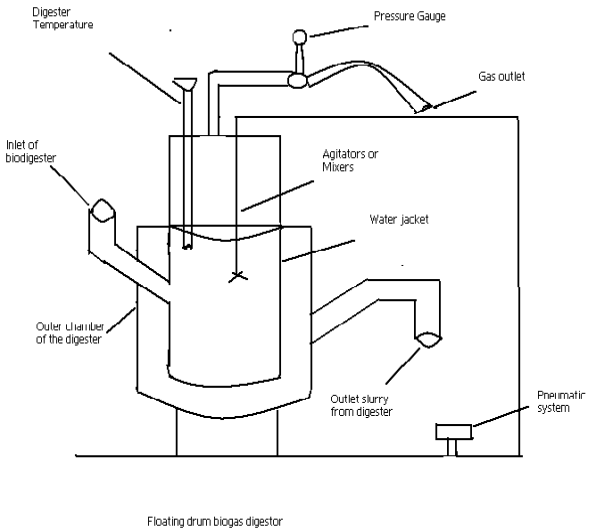


**Figure 1.** Schematic view of the experimental setup

The pH is measured from the digester using pH redox meter. Digester temperature is measured using thermometer (0 to 50ºC). The gas flow is measured using Alborg gas flow meter. The moisture content of the wastes are determined the waste by the waste by water methods used for the digester charging. Volatile solids (Vs) are the part of organic waste matter that undergoes biodegradation to biomethanation process. Generally more volatile solids present in the organic matter to the more biogas are generated in the end of the digestion period.

Result and Discussions

Daily biogas production from Exp1 and Exp2 were shown graphically in figure 2. The biogas yield is flammable at took place at various lag periods. In this case the Exp2 having higher gas production at 22nd day with 141 liters compare to Exp2 values. Why because white mustard and carrot peeling have higher C/N ratio about 30:5 so, the biogas yield is high. Then the figure 3 shows the cumulative biogas yield with hydro retention time.

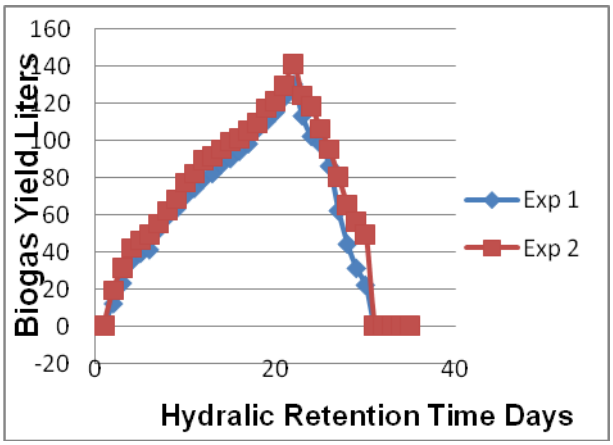


**Figure 2.** Daily biogas with respect to hydro retention time

Here also Exp2 achieved at 2421 liters of biogas at the end of digestion, In Exp1 achieved only 2140 liters of biogas, so white mustard and carrot peeling is the good combination of co-digestion.

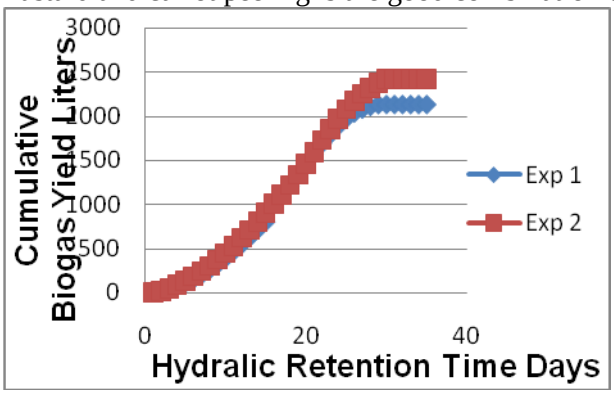


**Figure 3**. Cumulative biogas with respect to hdro retention time

These wastes are high in C/N ratio. These amounts of Carbon/Nitrogen nutrient source effects on the growth of microorganisms' it presence in the waste materials it causes of Enhance the biogas yield. Quantitative analysis of biogas components for the white mustard and carrot peeling indicates that $CH_4$ content is high for Exp1 feedstock and whereas $CO_2$,$H_2S$ was found to be high in Exp2 according to the source of the organic waste material.

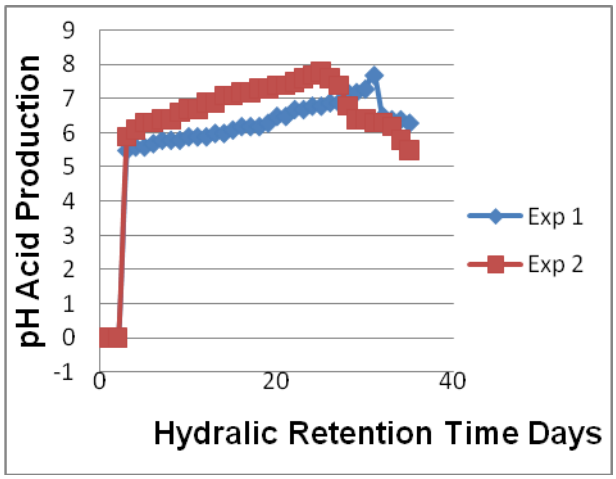


**Figure 4.** Cumulative biogas with respect to hdro retention time

The figure 4 shows the Acid Production (pH) with hydro retention time. Generally acid concentration greatly affects the biogas yield. Methanogenic reaction is very high as bacterias utilize the waste more readily so biogas generation decreasing. Simplication of process is methanogenic reaction that is Ts % reduced. In the biogas yield and methane form microorganisms is very sensitive to temperature changes during the digestion period. The figure 5 shows the digester temperature with respect to hydro retention time.

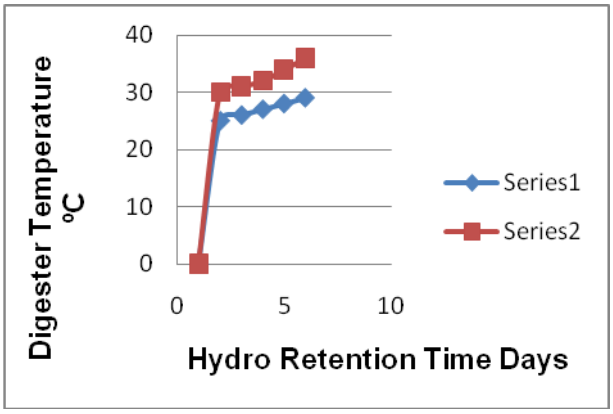


**Figure 5.** Cumulative biogas with respect to hdro retention time

A sudden change exceeding the temperature in Exp1 below 30ºC temperature the biogas production is very slow so temperature is one of the relative stability of biogas generation. In Exp2 above 30 to 35ºC temperature kills the pathogenic bacteria in the digester during digestion period. Then it is enhance the methanogenic bacteria in the digester. The fact that the pH of the Exp1, dropped to 6.8 in the last day of further supports the research a slow process startup. The acidifying bacteria produced acids at a much higher rate, than the methane forming bacteria were able to cope with. Another reason could be that the substrate material is decomposed to easily and therefore very susceptiable to acidification. That the methane content Exp2 constantly indicates that the certain areas possibly where a lot inoculum material is present, worked at a higher pH and produce gas while other Exp1 did not produce higher gas yield. Generally, Proper Carbon/Nitrogen ratio does the play an important role in the biogas production. Carbon/Nitrogen ratio ranging from 21:1 to 31:1 is always considered in suitable for anaerobic digestion by weiland [8]. During [9] the anaerobic digestion of beef manure in mixed and unmixed reactors. It is very clear that cow manure is an very effective feed materials for anaerobic digestion. It is significantly increase the cumulative biogas yield

## 4. Conclusion

These results results obtained from this research suggested that co-digestion of tradational market waste with inoculum can help to improve the biogas yield. Out of the three market wastes used (cabbage stem, white mustard, carrot peel) white mustard and carrot peel is the most effective in enhance the biogas yield. In this case the feedstock have higher C/N ratio and microorganisms. Further minimum time required for biogas yield from the biomasses tradational market wastes with increase in temperature of digestate. Thus temperature increase the production as well as the digester efficiecy.

## 5.References

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