

EXPERIMENTAL STUDY OF BIOGAS PRODUCED FROM THERMAL PRETREATED WATER HYACINTH, COWDUNG AND HUMAN URINE IN MESOPHILIC CONDITION

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ABSTRACT

Biogas, a clean and renewable form of energy could very well substitute for conventional sources of energy which are causing ecological and environmental problems and at the same time depleting at a faster rate. With increasing energy demand in the world and to keep environment friendly, biogas technology has attained a notable position for the future scope. This paper tells about anaerobic digestion of water hyacinth, cowdung and human urine in mesophilic condition to produce and enhance biogas. Water hyacinth is a lignocellulosic waste and is among the group of fastest growing plants. Its biomass has the potential to become a potential renewable energy source and replace conventional fossil fuels. Water hyacinths are treated as waste in rivers, ponds, but they have high potential in biogas production. Thus water hyacinth holds a strong promise in the production of clean renewable energy.

Keywords: *Biogas, Lignocellulosic waste, Water hyacinth, human urine.*

I. INTRODUCTION

In today's energy demanding life style, need forexploring and exploiting new sources of energy which are renewable as well as ecofriendly is a must. In rural areas of developing countries various cellulosic biomass are available in plenty which have a very good potential to cater to the energy demand, especially in the domestic sector. The worldwide distribution of Water hyacinths (*Eichhornia crassipes*) generally considered as an aquatic weed, has become a persistent and expensive aquatic problem damaging the environment, cause ecological and economic problems by impeding navigation and fishing activities, clogging irrigation systems and by creating a chronic shortage of dissolved oxygen harmful to the fauna and the flora (S.M. Mathur, et al. 2013) in the lake.

Biogas is obtained by anaerobic decomposition. Anaerobic Decomposition is the breakdown of complex organic molecules into useful form of energy by microorganisms in absence of oxygen without affecting the nature (Nwuche CO, et al. 2011).

Since the plant has abundant nitrogen content, it can be used a substrate for biogas production. Biomass experiments involving the use of water hyacinth for the production of biogas forcooking seemed to present a viable option. Biogas is an ecological fuel that may replace firewood. Water hyacinth's abundant biomass can be used to produce renewable energy, simply fermenting it in anaerobic digester.

II. WATER HYACINTH

The family Pontederiaceae has nine genera including Eichhornia, which has eight species of freshwater aquatics including water hyacinth. The name water hyacinth refers to its aquatic habitat and the similarity of the flower colour to that of the garden hyacinth (Parsons, et al. 2001). Water hyacinth, a free floating macrophyte, live at the air-water interface and form two distinct canopies i.e. leaf canopies comprising above water structures and root canopies comprising below water structures (Downig kunz, et al. 2012).

Water hyacinth is an erect, free-floating, stoloniferous, perennial herb (Center, et al. 2002). The mature water hyacinth consists of roots, rhizomes, stolons, leaves, inflorescences and fruit clusters.

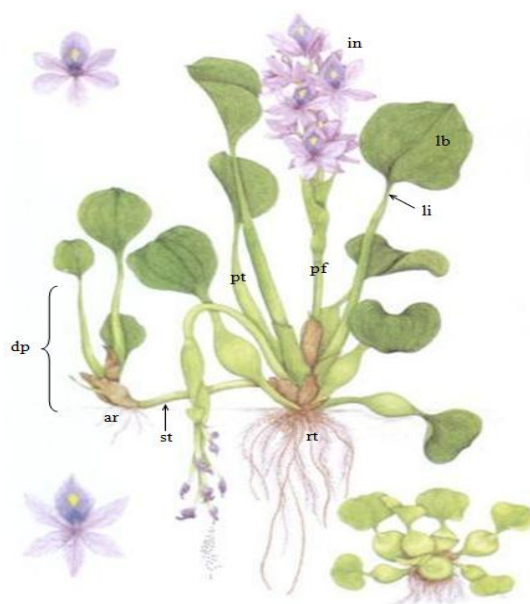


Figure: Morphology of water hyacinth plants with stolons

ar: adventitious root; dp: daughter plant; in: inflorescence; lb: leaf blade; li: leaf isthmus; pf: peduncle of flower spike; pt: petiole; rt: root; st: stolon.

III. MATERIALS AND METHODS

A large quantity of Fresh Water hyacinth was obtained from the lake near NIT Kurukshetra. This sample was washed in fresh water and then boiled in hot water so that porosity increases and easily and complete digestion takes place in digester. The boiled sample was sun-dried to reduce its moisture content. The dried sample of water hyacinth was then cut into small pieces to allow for more surface area to be acted upon by the microorganisms that bring about the anaerobic biodigestion. Rubber tube was used to collect the biogas produced while the daily temperature and Ph of slurry was taken and recorded by thermometer and Ph meter respectively. The volume of biogas was calculated assuming tube as a cylinder and finding volume of cylinder. The gas produced thus tested using biogas analyser and content percentage was calculated.

IV. EXPERIMENTAL SETUP

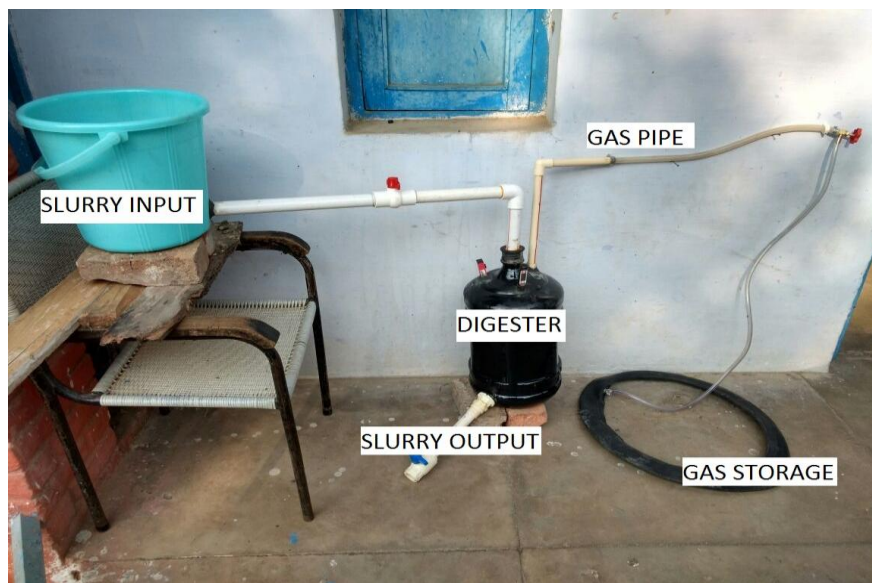


FIG. EXPERIMENTAL SETUP



Fig. digester

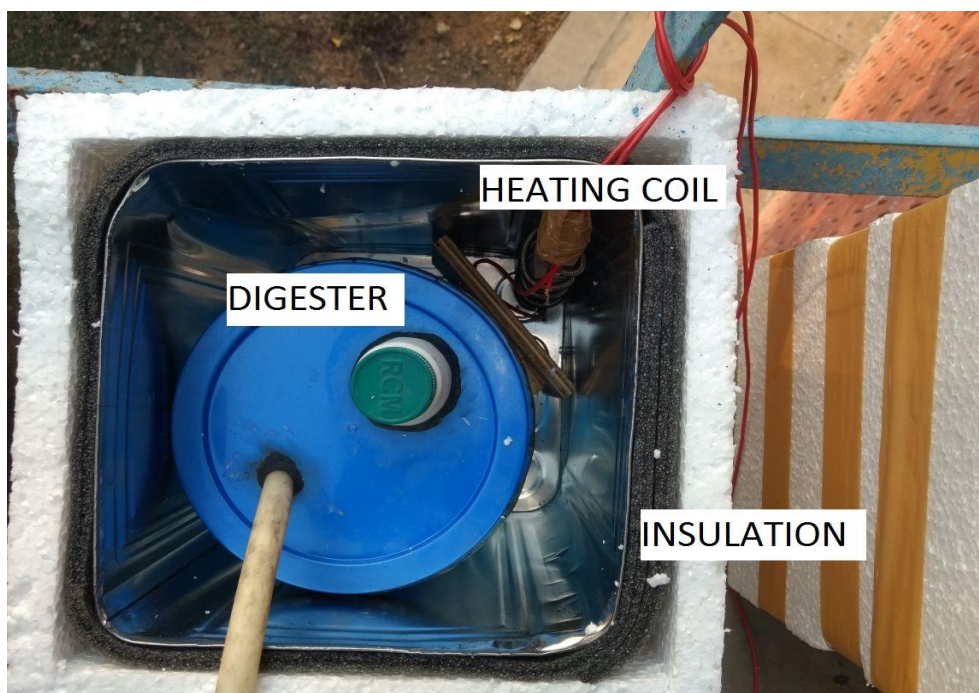


Fig. Insulated digester

The gas was collected in the tube continuously and then tested in gas analyser for different composition of gases.

VI. RESULTS AND DISCUSSION

From the results, the production of biogas with water hyacinth, cowdung and human urine is shown in the figure below.

Sr.	Test Description	Results
1.	Methane (CH_4)	27.7 %
2.	Carbon Dioxide (CO_2)	17.0 %
3.	Hydrogen Sulfide (H_2S)	NIL, PPM
4.	Oxygen (O_2)	19.9 %
5.	Balance Gas (N_2 , NH_3 , & H_2)	35.5 %

The volume of the biogas was measured for 33 days. The condition of digester was maintained in mesophilic condition i.e. 35 to 40°C and Ph was maintained between 6.5 to 7.0. Hydrogen sulphide was not calculated.

VII. CONCLUSION

The study revealed that it is possible to produce biogas from a mixture of water hyacinth and cow dung. This study forms an attempt to use the unwanted weeds as substrates for methane production. The different combination using cow dung and water hyacinth were tried and encouraging results were obtained when 50% Water hyacinth and 50% cow dung combination but when human urine was added then it enhances methane content and also hydraulic retention time was decreased.



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