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# Electricity Generation Using Water Hyacinth

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## ➢ ABSTRACT

Water hyacinth is a predominant invasive aquatic weed anchored mostly in shallow waters and constituting environment problems wherever it thrives. A work on the biogas potentials of water hyacinth plant as a substrate and as an environmental management practice is presented. 20kg of water hyacinth characterized substrate was mixed with. water at a ratio of 1:2 and the slurry was fed into a modified metallic digester of 84 litres capacity on a batch basis for 24 days. The system was operated at a mesophilic temperature range of 26 32°C. Results of yield indicated water hyacinth showed significant biogas yield with volumetric production at a rate of 1.2litres/day. Gas production was highest on the 18th day with a volume of 2.95 litres/day and corres

## ➢ INTRODUCTION

Water hyacinth is widely regarded as the world's worst aquatic weed due to its ability to form dense and impenetrable floating mats on the water surface. It is a free floating, annual or perennial aquatic plant. It is native to Brazil and has been introduced in India as an ornamental plant in West Bengal in early 20$^{th}$ century but now; it is one of the worst weeds of aquatic bodies in India. It is estimated to cover over four million hectare of water surface it propagates by vegetative and sexual methods. The plant is also reproduced by seeds. A single water hyacinth plant can be producing few to five thousand seeds. The seeds may sink to bottom where they can remain viable up to 20 years. The floating mats can cause considerable biodiversity impacts by displaying native vegetation, decreasing light penetration preventing birds and other fauna from accessing the water, which results in unsuitable habitats for fish and other aquatic fauna. During flood events heavy floating mats of the weed can dislodge can cause significant damage to downstream infrastructure such as bridges and fences, and to crops and pastures. Infestations also favorable breeding conditions for mosquitos and reduce aesthetics of waterways.

Biogas is a clean and environment friendly fuel produced through the anaerobic digestion of organic wastes suchas: cow-dung, vegetable wastes, municipal solid waste and industrial waste water. It is increasingly becoming important in domestic and industry as fuel due to its costs and cleanliness. The main component of the gas is methane, carbon dioxide, hydrogen, nitrogen and hydrogen sulphide. Water hyacinth can be used as a

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potential feedstock for biogas production due to its abundance and high carbon-nitrogen ratio. This study aims at evaluating the potential of utilization of water hyacinth for biogas production.

## ➢ PROBLEM DEFINATION

- **Fishing impossible.**

Due to enormous growth of water hyacinth in rivers and lakes fishing problems comes into play. As water hyacinth is dangerous to the growth of species living in rivers there is economical loss for fisherman.

Fig;1Fishing problem

- **Reduce water flow.**

As water hyacinth growth is very large in rivers and lakes flow of water is blocked highly. Due to this water may not go further and many problems can take place such as growth of mosquitoes and harmful bacteria's which may lead to various diseases.

**Fig;2Water hyacinth blocked river**

- **Reduce oxygen level in water.**

When the water in the river is stationary the oxygen level is low as water does not receive adequate sun light. Hence due to water hyacinth oxygen level is decreased. This is harmful for water animals.

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**Fig;3Reduced Oxygen level**

## ➢ THEORY

- **Water Hyacinth**

Water hyacinth is a floating plant, an invasive nuisance plant*anon grata* in much of the world where it often jams rivers and lakes with tons of floating plant matter . A healthy acre of water hyacinth can weigh up to 200 tons. It grows in freshwater and has lavender flowers and round leathery leaves attached on spongy stalks.The plant has dark feathery roots.form mats that clog waterways making fishing impossible and reduces water flow.

Fig4; Water Hyacinth in lake

Mats may double their size in as little as 6 - 18 days. It degrades water quality by blocking the air-water interface and greatly reducing oxygen levels in the water, eliminating underwater animals such as fish and greatly reduces bio-diversity: mats eliminate native submersed plants by blocking sunlight, alter immersed plant communities by pushing them away and crushing them, and also alter animal communities by blocking access to the water and/or eliminating plants the animalsdepend on for shelter and nesting.

Millions of dollars a year used to be spent onwater hyacinth control. Several methods have been developed to help in its management: mechanical harvesters and chopping, biological controls (insects, fish) and use of water hyacinth registered aquatic herbicides

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- Biogas

Biogas is lighter than air and has an ignition temperature of approximately 700˚C (diesel oil 350˚C; petrol and propane about 500˚C). The temperature of the flame is 870˚C. Biogas consists of about 60% methane (CH4) and 40% carbon dioxide (CO2). It also contains small proportions of other substances, including up to 1% hydrogen sulphide (H2S). The methane content and hence the calorific value is higher the longer the digestion process. The methane content falls to as little as 50% if retention time is short. If the methane content is considerably below 50%, biogas is no longer combustible. The first gas from a newly filled biogas plant contains too little methane. The gas formed in the first three to five days must therefore be discharged unused.The methane content depends on the digestion temperature. Low digestion temperatures give high methane content, but less gas is then produced

Fig; 5 constroction of Digester

Fig6; Digester Inner side

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➢ **Factors affecting biogas production**

In order to enhance the performance ofbiogas generation process, and to prevent the process failure, certain operating parameters such as temperature, p11, nutrient addition, mixing ratio and retention period, all need to be controlled. Micro-organisms are highly sensitive to pH changes. Buffering is necessary for pH control and therefore an essential step in the overall operation (Garba and Sambo 1992). Temperature is an important physicochemical factor in the degradation of organic wastes and as such the anaerobic process is dependent on temperature Temperature has significant effect on biogas production more especially when fresh plant material is involved. Two temperature ranges have been reported to affect tile overall process of biogas production. These are; tile mesoph ii ic temperatures and thermoph ii ictemperatures. Tile mesophilic temperature range of 30-40°C has been reported to

effectively aid in degradation of organic wastes that are not lignified. Increased biogas production was reported in tile digestion of fresh water weed known as Pistiastratiotes(water lettuce) at mesophilic temperature of 30 °C.). Tile mesophilic temperature range is preferred when fresh plant material is involved (Maishanu et.al, 1993) Also, it is easier to maintain the digester at this temperature. Methane-producing bacteria are, very sensitive to sudden thermal changes and

therefore any drastic change in temperature should be carefully avoided so that no abrupt decrease in gas production occurs. The digestion process must thus be designed to operate at constant temperature conditions. Temperatures above 65°C cause gas production to stop (Garba and Sambo, 1992). Anaerobic digestion process can be operated over p11 range of 6.0 — 7.0. As organic acids are produced during the breakdown of cellulose, when the pH drops below 7.0, there is a significant inhibition of rnethanogellic bacteria and tile acid conditions of a pH of 4.0 are toxic to these bacteria. At p1-I of 4.0, tile production of gas will be very low and later stops (Garba and Sambo 1992). Several steps such as introduction of bacteria having cellulolytic capacity, preheating the media material, milling the media material, chemical treatments with NaOHetc, aid drying have been shown to improve biogas yield


Fig;7porposed construction

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## ➢ CONCLUSION

The study shows that water hyacinth is a good feedstock and that can be utilized as a renewable energy source. The production profiles compares well with those of conventional feed stocks such as cow dung. The utilization also provide an innovative way of managing the invasion of the weed in freshwater bodies in an environmentally sound manner.

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