

Utilisation of water hyacinth (*Eichhorniacrasspies*) biomass for the production of Biogas.

Edwardina Edward

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University of Dar es Salaam, college of social sciences, 2000

The infestation of water hyacinth (*Eichhorniacrasspes*) in Lake Victoria has caused serious environmental, social and economic problems. The associated effect on the water quality and fish fauna poses a big threat on the freshwater life and food chains, which depends upon the lake. Different control measures (i.e. Mechanical/ manual, chemical and biological methods) have been taken. However, during recent years, the utilisation of the plant for beneficial uses has received great attention.

The study was carried out to establish optima conditions for production of biogas from water hyacinth biomass. The following experiments were carried out (i) Qualitative analysis of water hyacinth biomass. (ii) the effect of substrate loading, particle size and incubation time on methane and volatile fatty acids productions. (iii) Effect of substrate loading in sem-batch and batch process and also preliminary economic analysis of the project was done. It was found that volatile solids (VS. i.e. loss of material when samples are burned at 550oc for two hours) and cellulose soluble of water shoots (WHS) were 80.81% and 22.72% respectively. These values were 5.6% and 3.5% higher compared to the corresponding values for whole water hyacinth (WWH) respectively. Also the lignin content from WWH was 41% higher than that from the WHS. These differences were attributed to the presence of root system in the WWH.

The maximum methane of 72.53% v/v at substrate concentration of 25g/l and particle size less than 1mm for WHS was achieved after five days of incubations. However, for WWH methane content was 65.67% v/v at the same characteristics and conditions. This was attributed to the fact that, WHS had more fermentable matters compared to WWH as observed in the investigation of the composition of that biomass. The experiments revealed that the methane yield in batch process was 0.166 NL/ g VS added at substrate concentration of 25g/l after six days of incubation. The methane yield in semi-batch process was 0.153NL/g VS added at 1.30 g VS/litre, day and retention time of 15 days. The difference in methane yields was due to the difference in the microbial activities between the two processes caused by the microbial population imbalances.

The preliminary economic analysis was evaluated; it was established that approximately 15.600 tons of fuelwood could be saved annually if an average of 2000 households switch from fuelwood to biogas. Furthermore, approximately 84,706 tons (172.6 ha) of water hyacinth can be harvested annually. It was concluded that, water hyacinth biomass is a potential substrate which can be used for biogas production that can help to control the plant-growth in a sustainable manner.